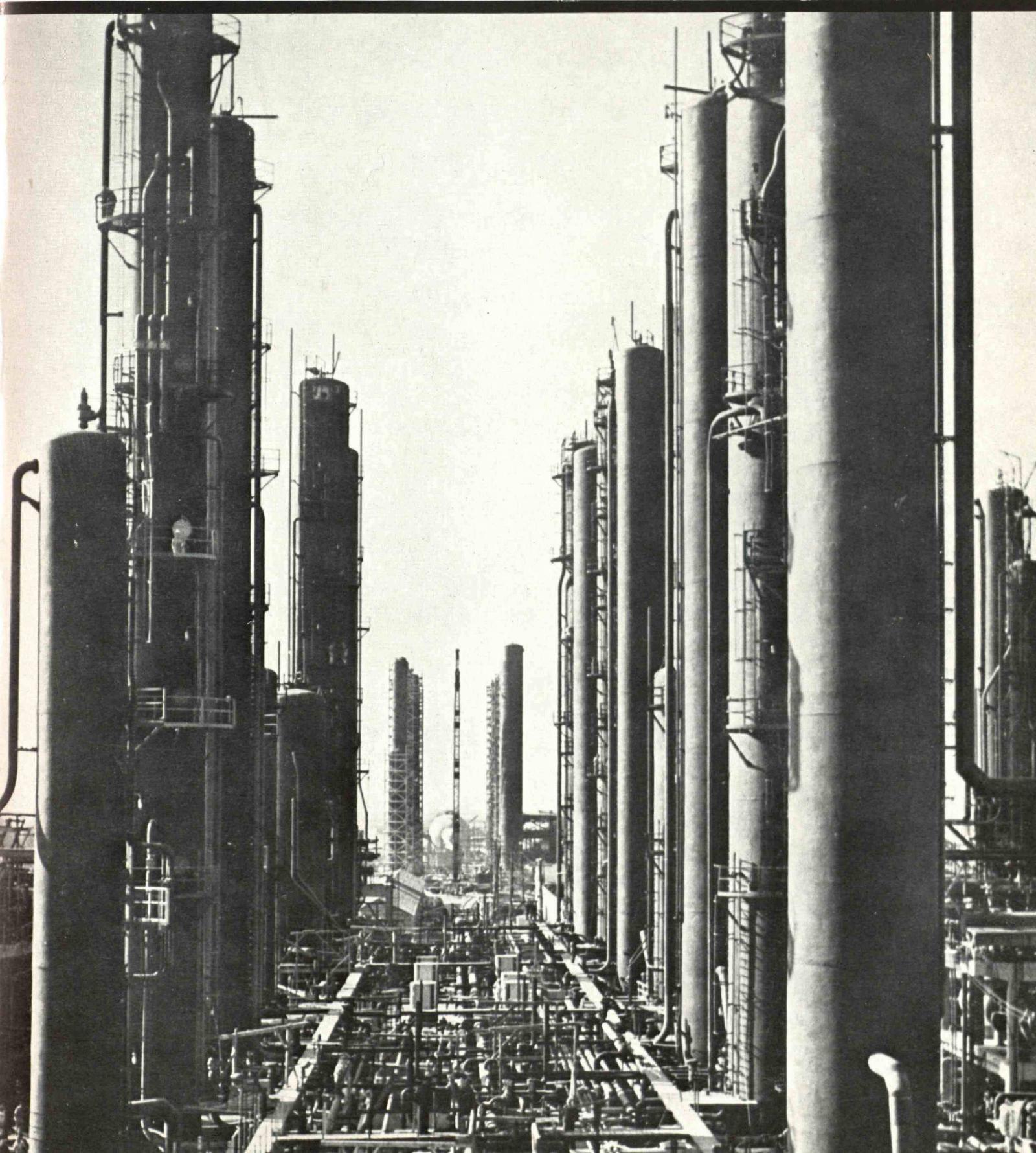


January 1944

TECHNOLOGY REVIEW

Title Reg. in U. S. Pat. Office



technology review

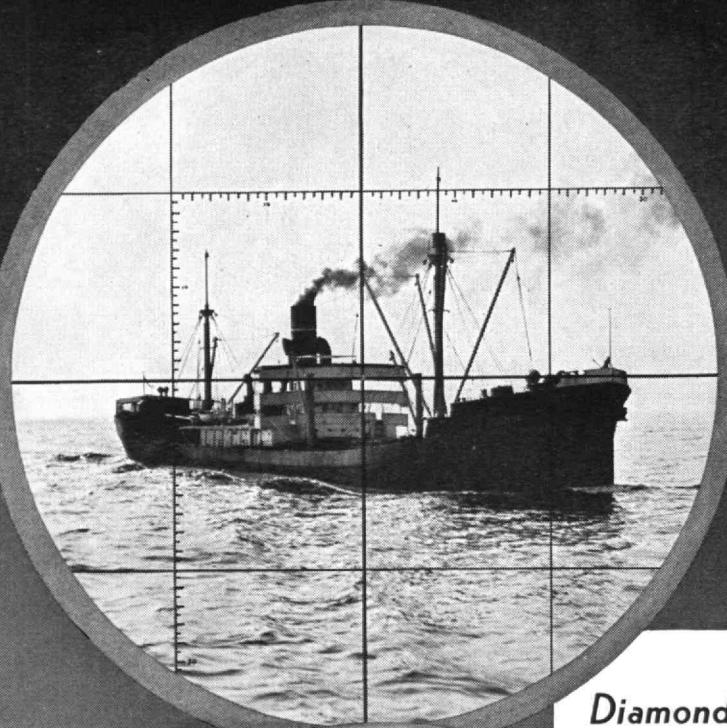
Published by MIT

This PDF is for your personal, non-commercial use only.

Distribution and use of this material are governed by copyright law.

For non-personal use, or to order multiple copies please email
permissions@technologyreview.com.

NORTON *Diamond Wheels* HELP SINK ENEMY SHIPS



Diamond Wheels Have Put Optical Glass on a Mass Production Basis

The war's sudden demand for thousands upon thousands of lenses and prisms for binoculars, range finders, periscopes and other instruments literally swamped former methods of producing these optical products. The answer—Norton Diamond Wheels now grinding glass in high production, both in roughing operations and to a transparent finish.

In countless applications Norton Diamond Grinding Wheels are meeting the challenge of war.

Norton Company, Worcester 6, Mass.

Behr-Manning, Troy, N. Y., is a Norton Division

NORTON ABRASIVES



He was a MASTER MECHANIC

*... an avoidable eye
injury robbed him of
his much-needed skill*

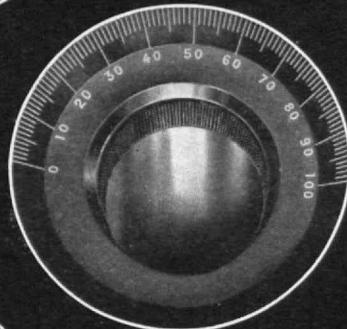
PROTECT YOUR WORKERS WITH AO GOOGLES

In split-seconds, injuries to unprotected eyes can cost you the services of workers you have spent years training . . . workers who are practically irreplaceable today.

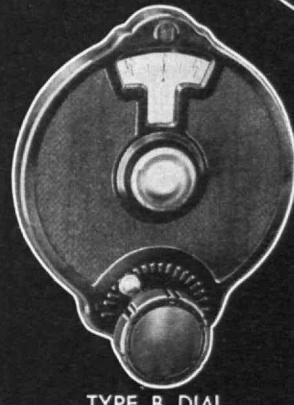
To avoid "Lost-Time-Eyes" in your plant, AO offers a wide line of comfortable, light, cool safety goggles. An investment in AO Goggles is quickly returned in saved manpower, added production, improved efficiency, and decreased costs.

A strong offense is your best defense against eye accidents. Take the initiative in establishing and maintaining a time-and-money-saving goggles program in your plant. Get in touch with your nearest AO Branch . . . located in all principal industrial cities . . . or have an AO Safety Representative call at your office.

American Optical
COMPANY
SOUTHBRIIDGE, MASSACHUSETTS
World's Largest Manufacturers of Products to Aid
and Protect Vision



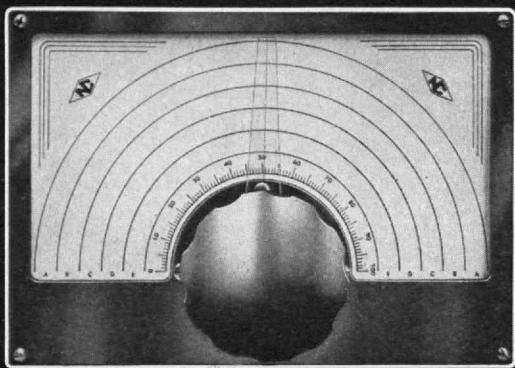
TYPE A
DIAL



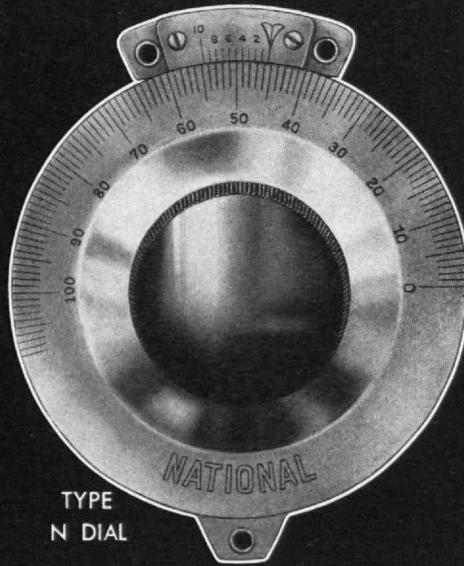
TYPE B DIAL



TYPE
BM DIAL



TYPE ACN DIAL



TYPE
N DIAL



The photograph immediately above shows an installation inside a Pan-American Clipper. National Dials have been a favorite with Pan-American Airways for many years.

TYPE N DIAL—Four-inch diameter with engine divided scale and flush vernier. 5 to 1 ratio.

TYPE ACN DIAL—Designed for direct calibration. Dial bezel size 5" x 7 1/4".

TYPE B DIAL—Compact, variable-ratio drive inclosed in bakelite case. Illuminator available.

TYPE BM DIAL—Similar to Type B, but smaller in size and having a fixed ratio.

TYPE A DIAL—The Original Velvet Vernier Dial, an unchallenged favorite for twenty years.

ACCURACY —and VELVET DRIVE

In War as in Peace, National Dials provide the smooth effortless control that makes the operator master of his equipment. Enormous increases in our productive capacity are meeting wartime demands, and National Dials are available with reasonably prompt delivery to users having the necessary priority.

NATIONAL COMPANY, INC.

MALDEN, MASS.





today's signs forecast tomorrow's needs

It will be a changed world. Some may think that the nation's chemical and petro-chemical equipment for war will serve adequately for the needs of peace. But still greater accomplishments are possible. And the inevitable struggle for competitive post-war advantage will certainly develop them.

Good as war-built plants and equipment may be, it is not enough to rest on their pattern. Reconversion or refitting for peacetime requirements calls for study *now*.

Adding to the experience of a long pre-war career, Badger has learned much during the past three years of handling many construction projects — small and large — for the manufacture of high octane gasoline, synthetic rubber stocks, explosives, and all sorts of chemicals, new and old.

This rich experience is available to you in change-over, modernization or new-plant undertakings. Badger is equipped to handle *everything* — either under sole responsibility or in co-operation with your own organization . . . from process, design and construction engineering, to material procurement, to labor employment and supervision, down to test-run operation. Badger is open for discussions now.

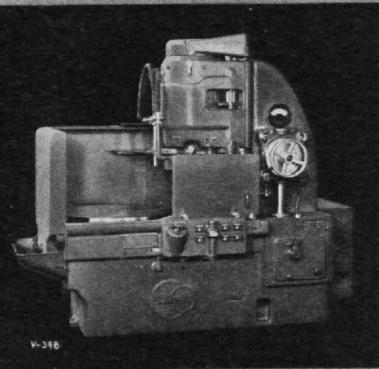
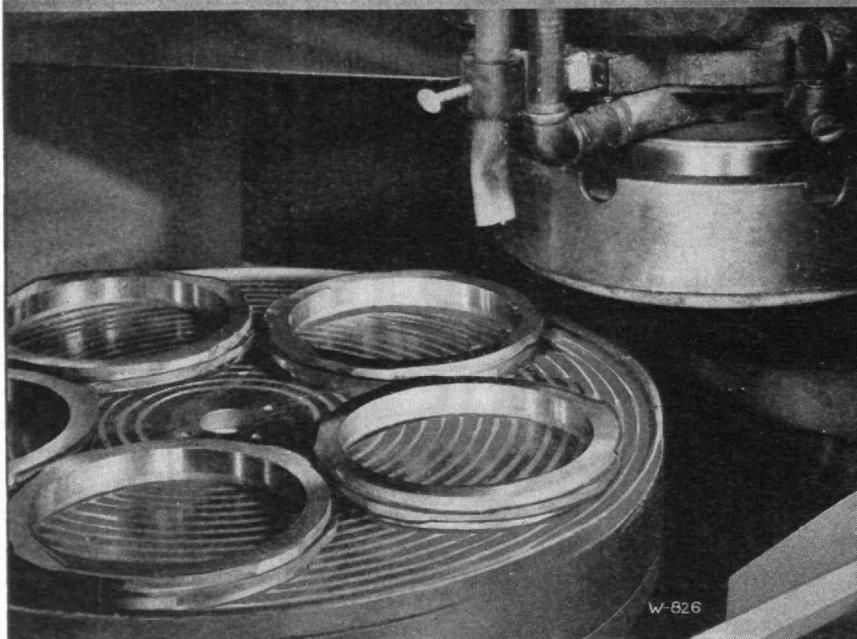
E. B. Badger & Sons Co.

BOSTON

Est. 1841

NEW YORK • PHILADELPHIA • SAN FRANCISCO • LONDON
*PROCESS ENGINEERS AND CONSTRUCTORS FOR THE
CHEMICAL, PETROLEUM AND PETRO-CHEMICAL INDUSTRIES*

"PUT IT ON THE BLANCHARD"



Grinding Nickel Steel Cams on the
No. 18 Blanchard Surface Grinder

These nickel steel Cams are finish ground on the
No. 18 Blanchard Surface Grinder.

.040" to .060" of stock is removed from one
side of these cams to limits of $\pm .001$ ". 109 pieces
are produced per hour.

This is only one of the many airplane engine
parts ground on the Blanchard. Some are held in
fixtures; magnetic, hand-clamping or automatic.

Send your blueprints for production estimates.

The **BLANCHARD**
MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS.



Send for your free copy of "Work Done on
the Blanchard." This book shows over 100
actual jobs where the Blanchard Principle
is earning profits for Blanchard owners.

**CHECK THESE
ADVANTAGES
OF BLANCHARD
GRINDING**

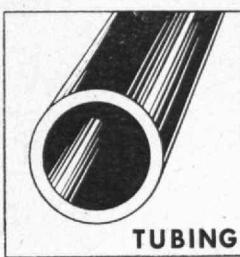
- ★ **Production**
- ★ **Adaptability**
- ★ **Fixture Saving**
- ★ **Operation Saving**
- ★ **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

..... Especially
valuable on jobs like
the one illustrated.

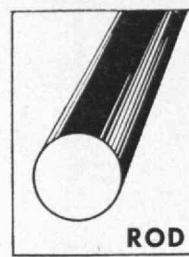
STOCK DIE SECTIONS



TEE



TUBING



ROD

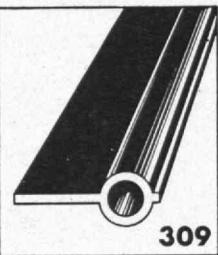


THREAD



HEX

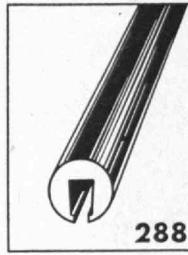
TYPICAL CUSTOM SECTIONS



309



307



288



207



167

Sandee EXTRUDED PLASTICS



Vinyl sleeveings in black, clear or N.E.M.A. colors can now be cut to any lengths (from $\frac{1}{8}$ " to $6\frac{1}{2}$ ") and IMPRINTED in one operation! Send for quotations on your needs.

Sandee has rapidly become one of America's largest extruders of thermoplastics. Here, every facility is available to render a highly efficient service:

1. Capable, long-experienced plastics engineers;
2. Thermoplastic materials and compounds of every description;
3. Expert tool and die makers;
4. Modern extrusion machines;
5. Exclusive Sandee methods of manufacture;
6. Fine tolerances employed assure meeting exacting specifications;
7. Absolute uniformity of size and finish; and,
8. Surprisingly prompt shipments in the face of difficult war conditions.

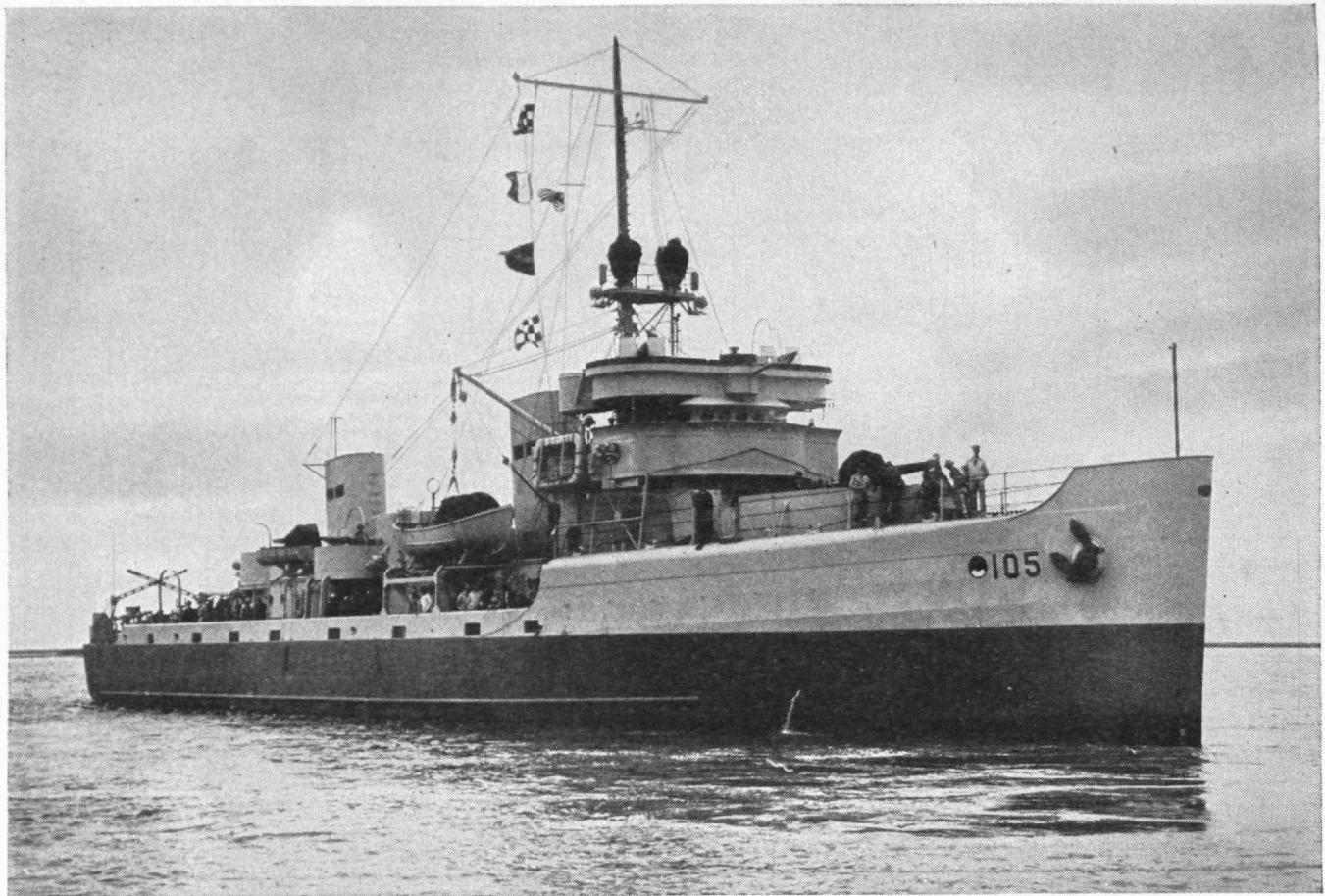
Sandee now serves our country's largest users of extruded plastics. Consult our engineers on your problems. Write today for samples and moderate cost estimates.

ELMER SZANTAY, M.E. '35, GENERAL MANAGER

Sandee Manufacturing Company

3945 NORTH WESTERN AVENUE • CHICAGO, ILLINOIS

EXTRUDED PLASTICS AND SPECIAL TOOLS



AM-105 U. S. S. PIONEER

She Has Good Stuff in Her



She has to have. The U.S.S. Pioneer is one of our Navy's mine sweepers. Cruising around in quest of enemy mines keeps a sailor on his toes.

Naturally, he feels confident when he knows he can rely on his ship.

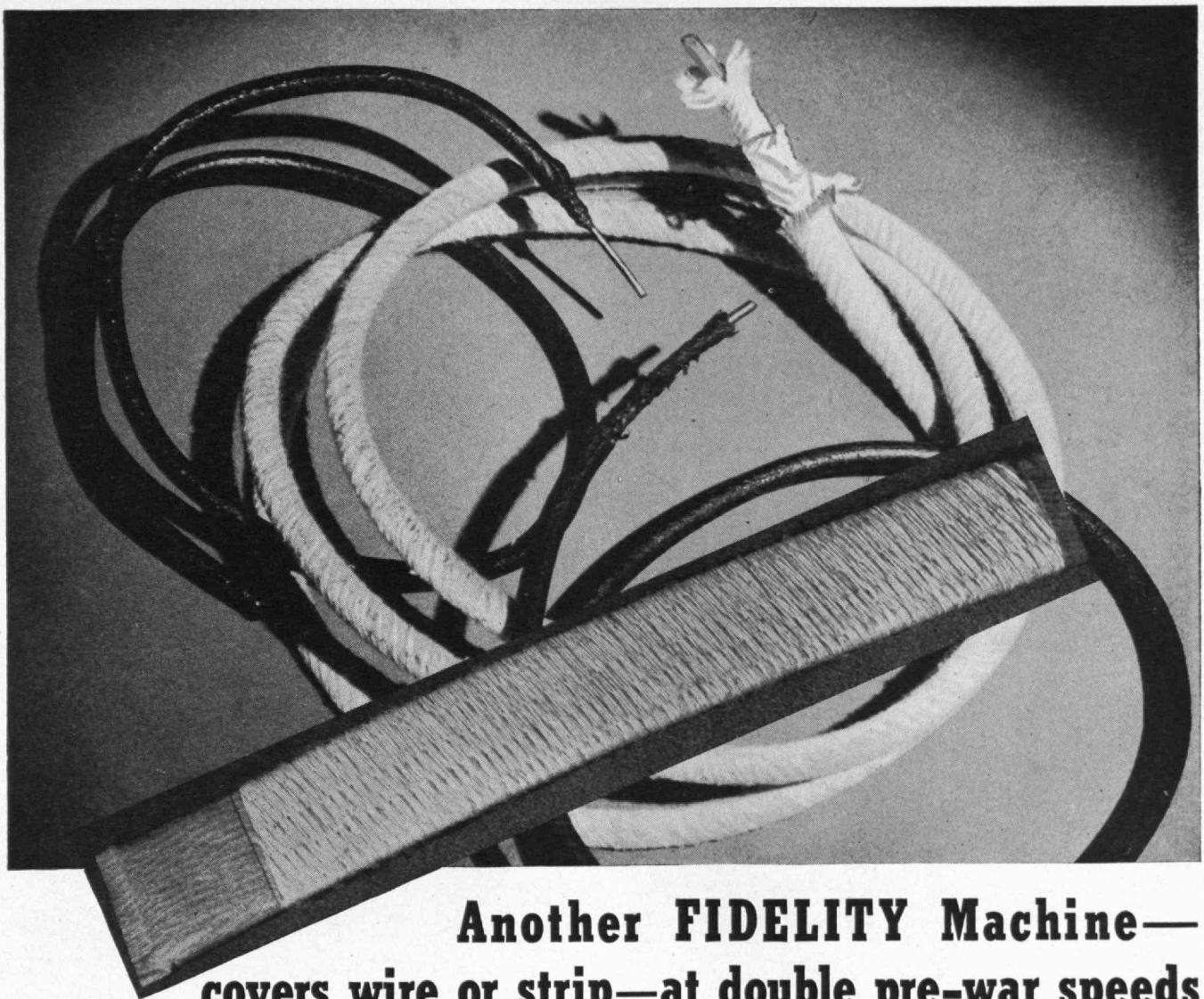
We're proud to say that the U. S. S. Pioneer is propelled by Diesel engines—made by the same Busch-Sulzer skilled workmen who are turning out precise ammunition hoists for the Navy's 5"/38 caliber guns . . . and engines for other naval and army craft, as well as engines for the U. S. Maritime Commission. Until this war program is completed, we can accept orders of high priority only for engines from 450 to 3600 horsepower.



BUSCH-SULZER BROS.—DIESEL ENGINE COMPANY
ST. LOUIS

AMERICA'S OLDEST BUILDER OF DIESEL ENGINES

BUSCH-SULZER
ST. LOUIS



Another FIDELITY Machine— covers wire or strip—at double pre-war speeds

Not only the bottle-neck of wire insulation, but other similar ones in covering round or flat rods of metal, plastic or other materials with cotton, linen or other fibres, have been removed by FIDELITY SINFRA Machine. In some cases, output was upped as much as 300%.

Still restricted to war production applications, these FIDELITY Machines will ultimately contribute just as effectively to peace-time manufacturing. If you face this kind of problem, either now or when competition returns, it is probable you can get a quick solution at FIDELITY.

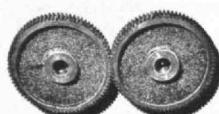
Whatever the problem, if it indicates a need for a special-purpose machine of the automatic, precision type, you can start preparing for the day of transition now by bringing it here where a skilled and experienced engineering staff is backed up by unusual shop facilities.

FIDELITY has designed and built a wide variety of machines for many purposes. This experience and the manufacturing equipment available are described in an interesting, well-illustrated book.

BUY MORE BONDS



Designers and Builders of Intricate, Automatic Precision Machines



FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.



Foothold in a Fog



Smoke Generator in Action

192,000 employees of General Electric are buying over a million dollars of War Bonds every week.

Good weather is bad weather for an invasion.

When American troops land on enemy beaches, it's often under cover of a friendly life-saving "fog."

American scientific and engineering ingenuity provided the equipment for our forces to make their own special invasion weather. For the "fog" is produced artificially by mobile smoke generators which blanket whole areas in an impenetrable white mist.

Months ago, the National Defense Research Committee enlisted the help of General Electric research scientists in developing an improved smoke generator for the Chemical Warfare Service.

Nobel prize winner Dr. Irving Lang-

muir and his associates evolved a new principle of smoke generation, upon which the Standard Oil Development Company designed and built the equipment. The smoke it produces is harmless; it doesn't even soil clothes. But it does keep our troops and their movements from the sharp eyes of enemy aircraft.

This smoke generator, which according to reports has saved lives in Allied landings wherever it has been used, is another example of American industry's research and engineering and manufacturing skill. Producing superior weapons for our troops today, these same resources will be available for all the American people tomorrow in building a better world. *General Electric Co., Schenectady, N. Y.*

GENERAL  **ELECTRIC**

952-4920-211

Hear the General Electric radio Programs: "The G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC
— "The World Today" news, every weekday 6:45 p.m. EWT, CBS.



The Spark that Lights the Flame of Victory

A pinpoint of fighting metal placed in the arc of the spectrograph writes its own signature on a photographic plate. Inside the instrument, the light from that flame is broken up by a prism as a prism breaks up sunlight. Each element identifies itself by a series of characteristic lines, always the same for the same basic element. It reveals to the spectrographer each constituent, what impurities are present and in what quantities.

Thus spectrography helps in controlling inspection. It keeps tough fighting steels tough, helps in development of

new fighting metals. Spectrography is used too in other fields . . . chemicals, foodstuffs, vitamins. It speeds research, control, and analysis. Today, spectrography is helping to build the tools of Victory as in peacetime it helps to make better cars and better breakfast foods.

Because Bausch & Lomb had long experience with such precision optical equipment needed in education, research, and industry, it was ready for quantity production of precision optical instruments of war such as gunfire control instruments, binoculars, and aerial photographic lenses. When the last gun

is fired, Bausch & Lomb will devote its enlarged experience to peacetime optical production. Through war and peace, Bausch & Lomb has continued . . . and will continue . . . to do the job it knows how to do best. *Here again optical science is seeing it through.*

For Bausch & Lomb Instruments essential to Victory—priorities govern delivery schedules.

BAUSCH & LOMB
OPTICAL CO. • ROCHESTER, N. Y.
ESTABLISHED 1853



**Give them
Extra
Care**

**... to Get
Longer Tool Life**

Give tools a little extra care. Don't drop or throw them loosely into a drawer. Keep fine tools in the boxes in which they are packed and do not measure moving work or in places where a tool may be injured by a revolving cutter.

A little extra care from every tool user will increase tremendously the number of tools available and help at the same time to increase production.



**BROWN & SHARPE
TOOLS**

**BATH
IRON WORKS
CORPORATION**

**Shipbuilders and
Engineers**

BATH, MAINE

THE TABULAR VIEW

Cautiously. — Few nonmilitary postwar matters promise more in potentiality or in difficulty than does that of aviation. There is satisfaction, hence, in presenting in this Review (page 137) a vigorous discussion of probabilities as against utopian possibilities in the skies for the years directly after peace. S. PAUL JOHNSTON, who through most of the years since his graduation from the Institute in 1921 has been closely concerned with aeronautical affairs, is Washington manager for the Curtiss-Wright Corporation. Offering a business view of a major phase of the general problem, Mr. Johnston's article affords valuable comparison with L. Welch Pogue's presentation of an administrative view of a similarly important phase in The Review for December. It will constitute a chapter in Mr. Johnston's book, *Wings After War*, which Duell, Sloan and Pearce have scheduled for publication about April 1.

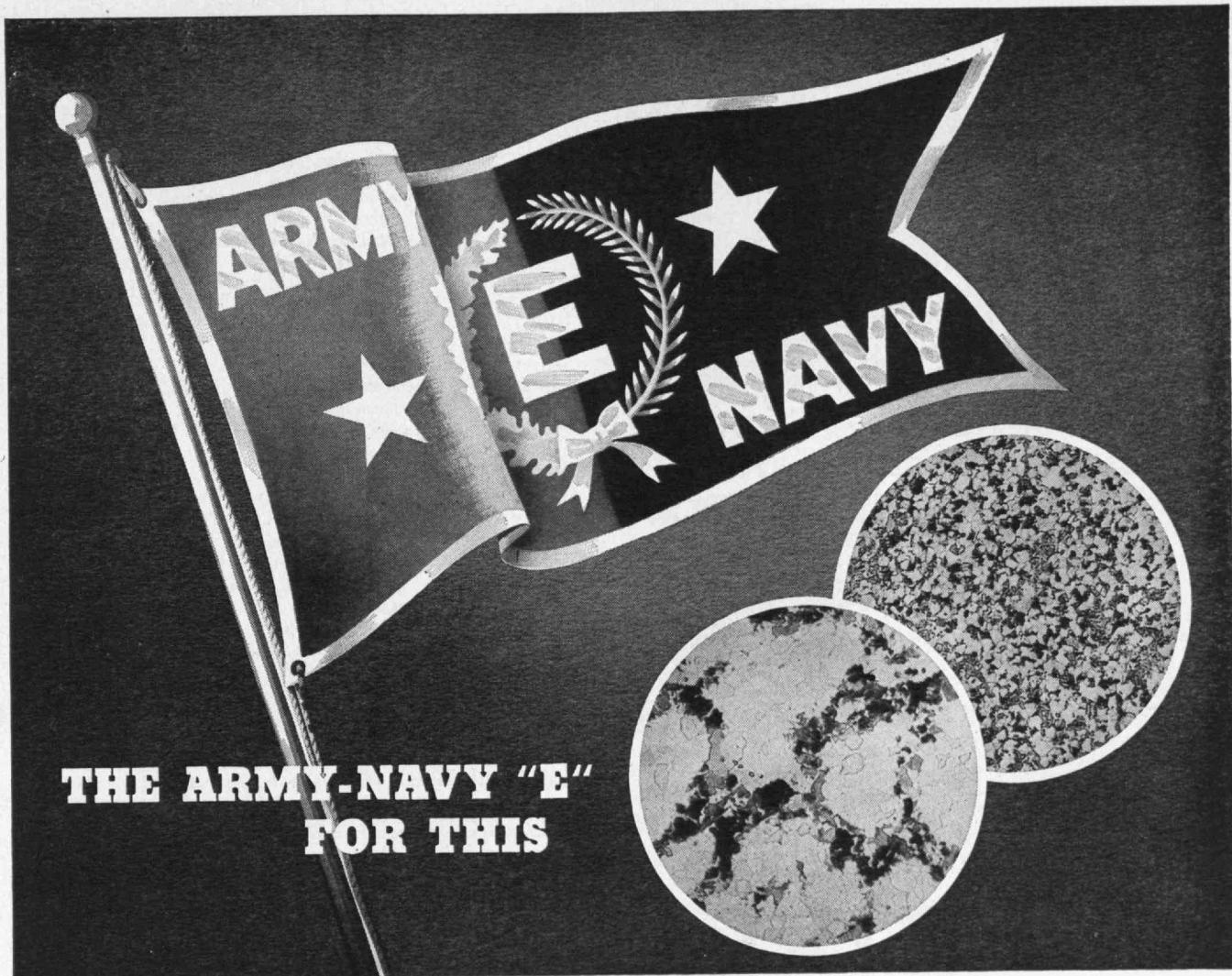
Ancestor. — One of man's distant kinsfolk is introduced to Review readers (page 139) in a graceful essay by M. F. ASHLEY MONTAGU, associate professor of anatomy, the Hahnemann Medical College and Hospital of Philadelphia, who is already familiar for varied contributions to our pages.

Comparison. — From his wide study of Civil War times, GEORGE FORT MILTON presents a footnote to military history (page 141) in pungent contrast to the history being made by American wartime industry today. Mr. Milton, formerly editor of the *Chattanooga News*, is the author of several volumes on the Nineteenth Century history of the United States, most recent among which is *Abraham Lincoln and the Fifth Column*.

Denomination. — Editorial Associate of The Review, EDWARD R. SCHWARZ in this issue chronicles (page 143) some interesting historical garners incidental to his professional activities as professor of textile technology at the Institute. Professor Schwarz, who was graduated from Technology in 1923, has written often for The Review both on the science and engineering involved in the development of textiles and on the philosophical and aesthetic values of fabric and fiber.

Earlier. — The time of origin of many an implement or process is often found to be subject to revision. Rarely, however, is this fact regarded as applicable to electrical affairs. That it may be is suggested (page 134) by DAVID O. WOODBURY, '21, who in the years since his graduation from the Institute has written widely on topics in science and engineering.

Versatile. — The career of Thomas A. Watson was one of many facets: He shared in the development of the telephone, was a student of geology at the Institute and of Shakespeare in England, was inventor and philanthropist, mechanic and artist. MERTON L. EMERSON, who writes appreciatively of this versatile life (page 146) from acquaintance with Mr. Watson, was graduated from the Institute in 1904 and maintains active leadership in alumni affairs.



On September 5th, 1942, our Mine and Mill at Climax, our Research Laboratory at Detroit and our Conversion Plant at Langeloth, Pennsylvania, were given the Army-Navy Production Award. Since then the award has been twice renewed. The two-starred flag we fly represents a full year of contribution to the war effort recognized by the Army and Navy.

Winning the award by the laboratory began in 1931. It was then that it was founded to meet our

needs for authoritative information about molybdenum-containing ferrous materials.

Pearl Harbor intensified our work with producers of war equipment—work that is aided considerably by the accumulated data and experience gained in over ten years of concentrated research.

We are particularly proud to be among those companies whose laboratories are entitled to fly the Army-Navy "E".

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.



MOLYBDIC OXIDE, BRIQUETTED OR CANNED •
FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City



Today the STARRETT Name on a Precision Tool MEANS MORE THAN EVER

STARRETT standards of accuracy and workmanship have been steadfastly maintained. Today, as always, the STARRETT name on a Micrometer, a Vernier Caliper or Height Gage, Dial Indicator or any fine measuring tool, gives its user that

familiar feel of confidence and respect that means more and better work.

The makers and distributors of Starrett Tools are doing everything possible to place these tools in the hands that need them most.

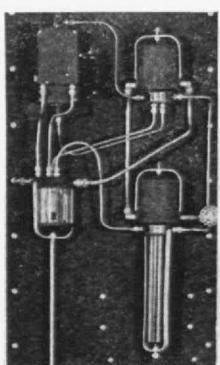


THE L. S. STARRETT CO., Athol, Massachusetts, U. S. A.
WORLD'S GREATEST TOOLMAKERS

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

CAMBRIDGE AUTOMATIC and CONTINUOUS GAS ANALYSERS ... For the Process Industries



Cambridge Recording Gas Analysers insure accuracy and trouble free performance to a degree hitherto unknown. Completely automatic. Eliminate human error. No chemicals. No intermittent sampling. No moving parts in Cambridge analysis units. Combination units enable the continuous recording of several components of a gas, simultaneously, on a single chart. The Recorder can be furnished with contacts for various control or alarm actuating circuits and may be located at considerable distance from any sampling point. Cambridge analysers are used for the determination of

- O_2 , H_2 , CO_2 , etc.
- COMBUSTIBLE GASES
- SPECIAL APPLICATIONS

Make use of our wide experience as producers of gas analysers for exacting industries. Send details of your problem to obtain our recommendations.

CAMBRIDGE INSTRUMENT CO., Inc.

3732 Grand Central Terminal

New York 17, N. Y.

MAIL RETURNS

On Flood Control

The letter which follows reaffirms statements already published in the American Engineer and other journals; they trenchantly express thought-provoking views on a subject of decided importance. — ED.

FROM EDGAR A. WEIMER, '98:

About 1884 I became interested in hydraulics under the guidance of my father, P. L. Weimer, and my brother-in-law, John Birkinbine, whose father was the foremost hydraulic engineer in this country and the builder of Philadelphia's first water system. As a part of my engineering education, I spent considerable time and money building dams of all types on a rather large flood control project located on several farms acquired by my father in Schuylkill County, Pa., for the purpose of providing me with an experimental area.

Flood control interested me to such an extent that I have made it a study from that early date up to the present. From 1900 to 1902 I resided along the banks of the Mississippi and Tennessee rivers, and as this period was in one of the flood-period cycles, I had the opportunity of viewing the futile and anxious attempts of the government to control these rivers by dikes, or levees. Expenditures for this purpose, I am told, amounted to not less than fifty million dollars a year from prior to 1900 to the present time. To be sure, the project gives jobs to about 3,000 government engineers, but the harm done trying to combat nature's laws has never been given the study it should.

My failure to get engineers to look into the damaging side of the problem has made me only more positive that I am correct in my contentions. Nature provided bends in streams and rivers to retard the flow of water. The flooding of lands provides retarding storage basins and maintains the fertility of the lands by deposition of layers of mud.

(Concluded on page 164)

— STEEL —
HOT AND COLD ROLLED
DEFORMED BARS FOR CONCRETE

Stahleker Steel Corp.

Second and Binney Sts., Kendall Sq., Cambridge, Mass.

Telephone Trowbridge 1440
WALLACE BLANCHARD, '16, Treasurer

Speed with
Economy

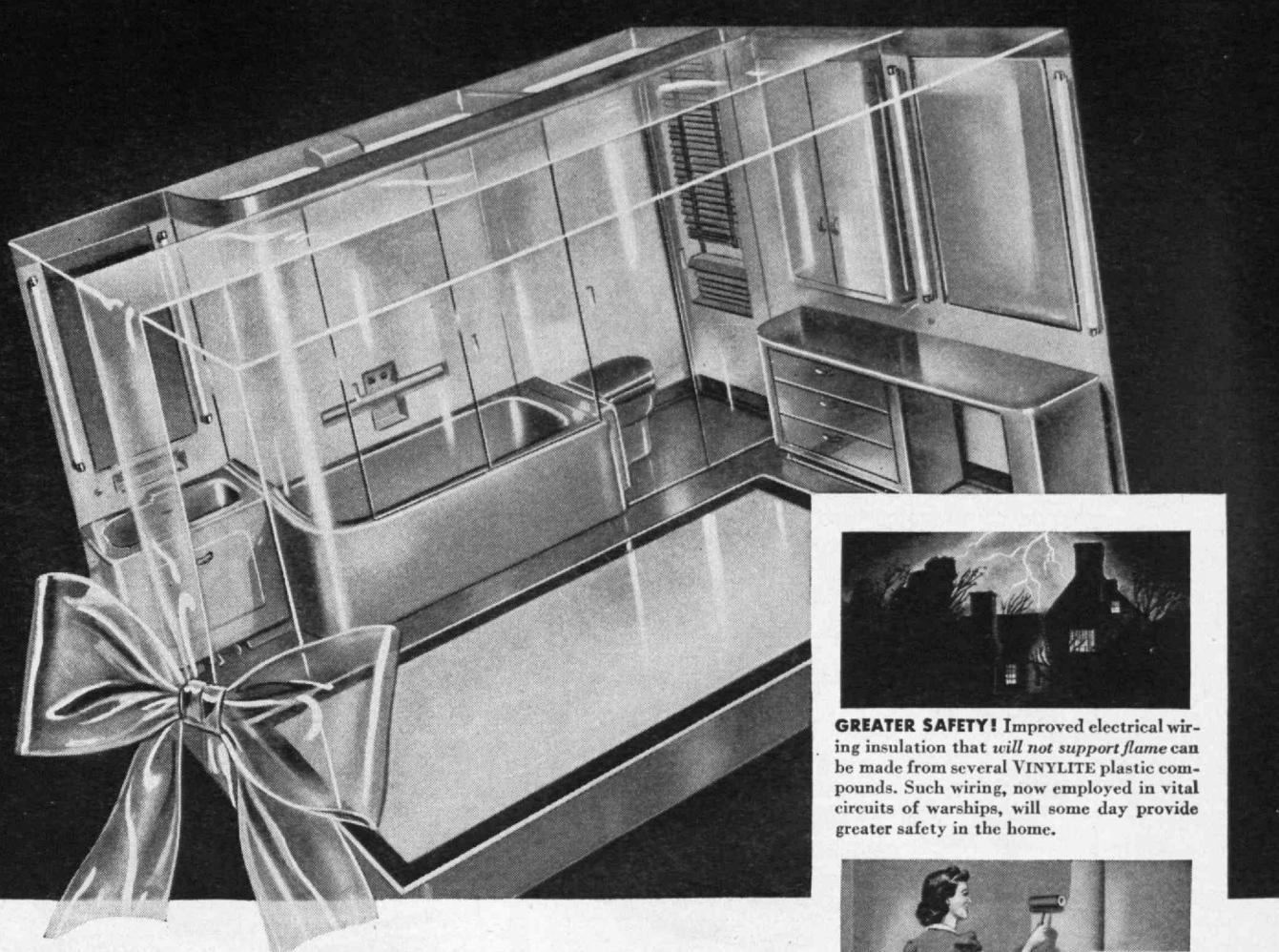


U. S. Industrial Chemicals, Inc.

In our weekly "job meetings" each building operation comes up for examination in detail by our full staff, with complete minutes of each meeting sent to the owner. In this way, work is continuously planned ahead and coordinated.

W. J. BARNEY CORPORATION
101 PARK AVENUE, NEW YORK
INDUSTRIAL CONSTRUCTION

Alfred T. Glassett, '20, Vice President



Plastics Will Mean Better Homes

... and more of them!

EVEN TODAY, plastics men can vision a bathroom with practically everything in it made of plastics or containing plastics in some form. Imagine such a bathroom, costing less to manufacture, to ship, and to install, delivered as a unit to your home!

The raw materials to make better homes with more bathrooms and finer kitchens come true are in existence today . . . in VINYLITE and BAKELITE resins, and plastics made from them.

BAKELITE resin-bonded plywood, like that from which planes and torpedo boats are made, can be used to make floors, walls, ceilings, and furniture.

The type of plastic film used in waterproof, chemical-resistant food bags and rifle covers can be fabricated into mildew-proof shower curtains. VINYLITE resins can also be made into rot-resistant floor coverings that can be walked on millions of times without showing appreciable wear!

Our engineers know from the record of VINYLITE plastic-coated life raft sails, sleeping bags, and life preservers, that

VINYLITE plastics and compounds can be used in the future to bring you wall coverings, window curtains, and furniture finishes that will outlast anything now available.

Under heat and pressure, VINYLITE and BAKELITE plastics can be molded into numberless useful forms. Experience gained in molding war equipment will help to bring you such things as molded plastic furniture which will be lighter, easier to move, easier to keep clean!

Spun plastics made from vinyl resins are resistant to rot. Right now, such plastics are used for making jungle hammock ropes and vital chemical filters. They also can be fashioned into draperies, upholstery, stockings, and other articles of clothing . . . sun-proof, water-proof, and moth-proof!

VINYLITE and BAKELITE resins and plastics, and many new techniques for using them, are peacetime research achievements of CARBIDE AND CARBON CHEMICALS CORPORATION and BAKELITE CORPORATION, both Units of UCC. Fabricators converting these raw materials into finished articles are making them mean more and more to you.



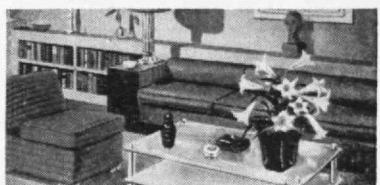
GREATER SAFETY! Improved electrical wiring insulation that *will not support flame* can be made from several VINYLITE plastic compounds. Such wiring, now employed in vital circuits of warships, will some day provide greater safety in the home.



MORE BEAUTY! New *washable* water paints based on BAKELITE resins, will bring new beauty to homes. These paints are inexpensive . . . and *easy to apply!*



LESS EXPENSE! Use of BAKELITE molding plastics in making washing machines, refrigerators, and many other household devices and fixtures can mean lower-priced, longer-lasting equipment for you.



LESS WORK! Easier cleaning of plastic-treated walls, ceilings, and floors. Plastic furniture and upholstery that are easier to keep clean. Yours in the future!

BUY UNITED STATES WAR BONDS AND STAMPS

UNION CARBIDE AND CARBON CORPORATION

30 East 42nd Street  New York 17, N. Y.

Principal Units in the United States and their Products

ALLOYS AND METALS

Electro Metallurgical Company
Haynes Stellite Company
United States Vanadium Corporation

CHEMICALS

Carbide and Carbon Chemicals Corporation
ELECTRODES, CARBONS AND BATTERIES
National Carbon Company, Inc.

INDUSTRIAL GASES AND CARBIDE

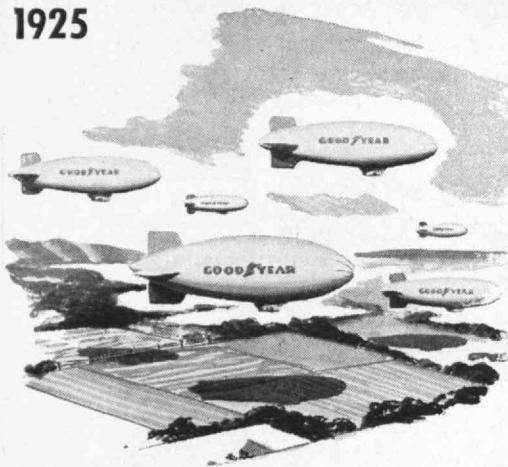
The Linde Air Products Company
The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS

Bakelite Corporation
Plastics Division of Carbide and
Carbon Chemicals Corporation

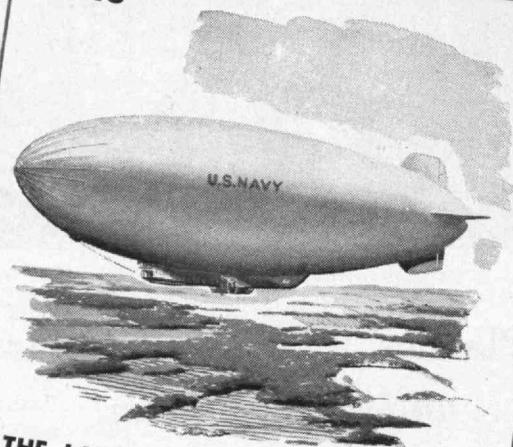
Trail Blazing in the Skies

1925



THE LARGEST COMMERCIAL NON-RIGID AIRSHIP FLEET in the world was built and flown by Goodyear in the interval between World Wars I and II. Beginning with the launching of the airship Pilgrim in 1925, no less than twelve airships have flown the Goodyear flag from eight operational bases, located from coast to coast. These ships flew a total of 4,000,000 miles without a single mishap, providing a great increase of knowledge regarding air structure, meteorology and airship engineering that has been of inestimable value to the nation in wartime lighter-than-air operations.

1943



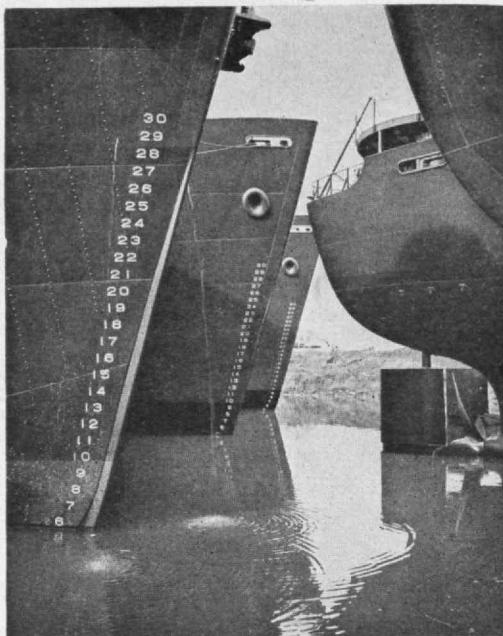
THE LARGEST NON-RIGID AIRSHIP EVER BUILT is the new M-1, recently completed by Goodyear Aircraft for the United States Navy. Approximately 50% larger than the Goodyear-built airships now so effectively protecting America's coastal sea lanes, the M-1's wider cruising range and greater bomb-load capacity make it a more effective member of the anti-submarine team. Distinctive feature of the M-1 is its three-unit, articulated control cabin that distributes its weight over a larger area of the envelope—a novel application developed by Goodyear Aircraft out of its long experience in lighter-than-air design.

HOW GOODYEAR AIRCRAFT CORPORATION SERVES THE AIRCRAFT INDUSTRY

1. By constructing subassemblies to manufacturers' specifications.
2. By designing parts for all types of airplanes.
3. By re-engineering parts for mass production.
4. By extending our research facilities to aid the solution of any design or engineering problem.
5. By building complete airplanes and airships.



GOOD  **YEAR**
AIRCRAFT



Loren Smith from Black Star

Liberty ships in an outfitting basin

VOLUME 46

NUMBER 3

THE TECHNOLOGY REVIEW

TITLE REGISTERED U. S. PATENT OFFICE

EDITED

AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CONTENTS for JANUARY, 1944

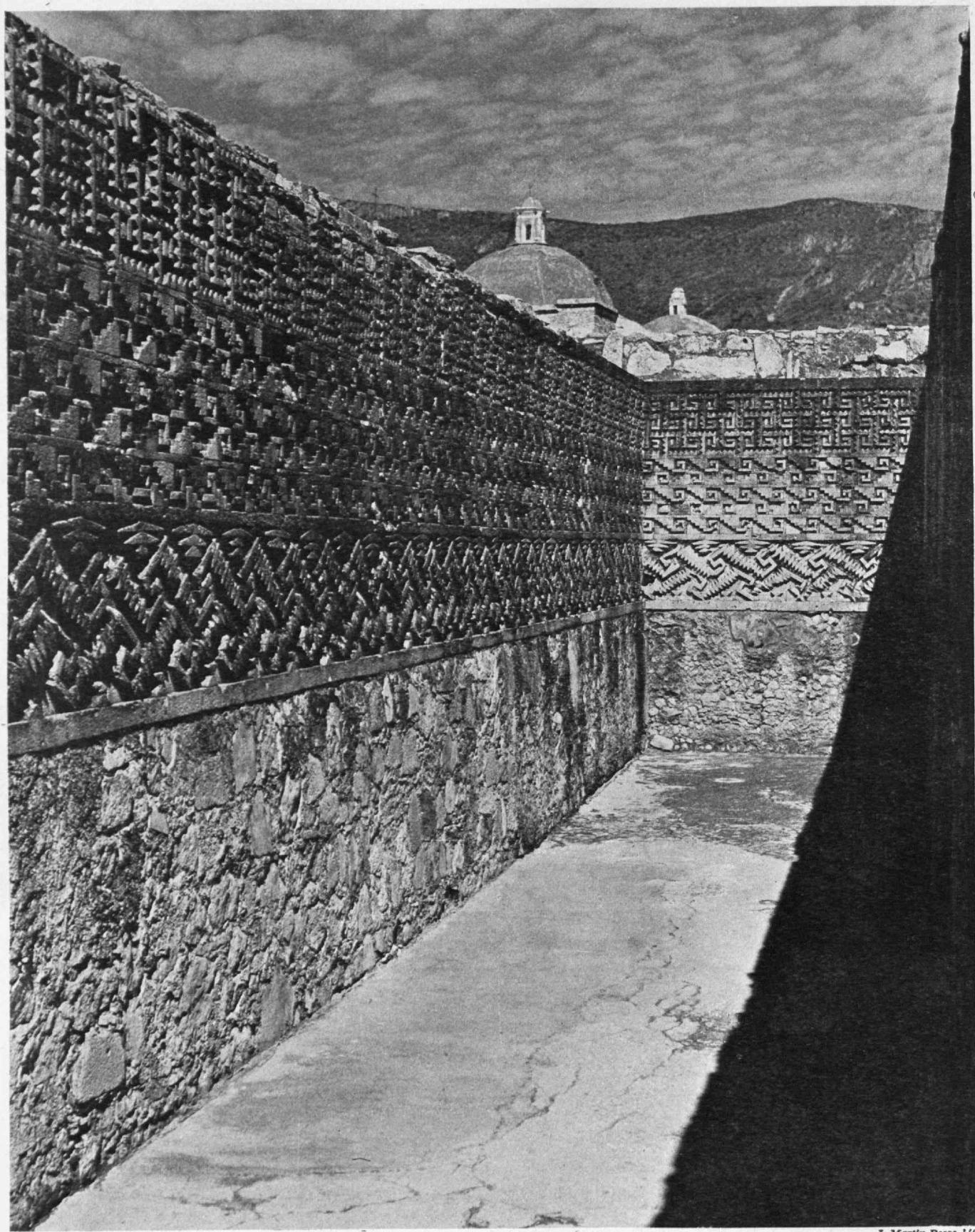
THE COVER — RUBBER PLANTATION: AMERICAN STYLE

Distilling section of a butadiene plant. From a photograph for the Neches Butane Products Company

ANGLE	FRONTISPICE	132
THE ANCIENTS HAD A BATTERY FOR IT	BY DAVID O. WOODBURY	134
AVIATION AFTER THE WAR	BY S. PAUL JOHNSTON	137
<i>Airy Utopias Are Likely to Remain Just That for Some Years</i>		
MEET TARSIUS	BY M. F. ASHLEY MONTAGU	139
<i>Man's Most Distant Ancestor</i>		
CONVERSION AND THE CONFEDERACY	BY GEORGE FORT MILTON	141
<i>In the Production of Munitions the South Scored a Success</i>		
FABRICS OF OUR FATHERS	BY EDWARD R. SCHWARZ	143
<i>Language Records the Linking of Cloth with Civilization</i>		
RECOLLECTIONS OF THOMAS A. WATSON	BY MERTON L. EMERSON	146
☆ ☆ ☆		
THE TABULAR VIEW		126
<i>Contributors and Contributions</i>		
MAIL RETURNS		128
<i>Letters from Review Readers</i>		
THE TREND OF AFFAIRS		133
<i>News of Science and Engineering</i>		
THE INSTITUTE GAZETTE		145
<i>Relating to the Massachusetts Institute of Technology</i>		

Published monthly from November to July inclusive on the twenty-seventh of the month preceding the date of issue, at 50 cents a copy. Annual subscription, \$3.50; Canadian and foreign subscription, \$4.00. Published for the Alumni Association of the M.I.T.: Francis J. Chesterman, President; Edwin D. Ryer, Raymond H. Blanchard, Vice-presidents; Charles E. Locke, Secretary; Ralph T. Jope, Treasurer. Published at the Rumford Press, 10 Ferry Street, Concord, N. H. Editorial Office, Room 3-219, Massachusetts Institute of Technology, Cambridge 39, Mass. Entered as second-class mail matter at the post office at Concord, N. H. Copyright, 1943, by the Alumni Association of the Massachusetts Institute of Technology. Three weeks must be allowed to effect changes of address, for which both old and new addresses should be given.

Publisher · H. E. LOBDELL *Editor* · F. G. FASSETT, JR. *Business Manager* · R. T. JOPE
Editorial Associates
J. E. BURCHARD PAUL COHEN J. R. KILLIAN, JR. P. M. MORSE
J. J. ROWLANDS E. R. SCHWARZ
Staff { *Editorial*: JANE McMASTERS, MIRIAM GOSIAN
 Business: MADELINE MCCORMICK, RUTH KING



J. Martin Rosse, '40

ANGLE

Ruins of the Priests' Palace in the ancient town of Mitla in the state of Oaxaca, Mexico

THE TECHNOLOGY REVIEW

Vol. 46, No. 3

January, 1944



The Trend of Affairs

Backward Glances Ahead

MARCH the 21st is possibly the most significant politically of the backward glances which lie before us in 1944. It was 90 years ago that day that Commodore Perry concluded with a self-styled tycoon the treaty which brought Japan into contact and commerce with the Western world. The record of the sons of the cherry blossom over the decades since will ring a few jangling bells during 1944: July 23, 1894, Japan seized the palace and the king of Korea, starting a war with China; February 8, 1904, Japan went to war with Russia; August 23, 1914, Japan went to war with Germany. As history hath it, the mikado's undertaking against the Chinese in 1894 grew out of the Japanese conviction that a military success was essential to the recognition of Japan as a power by the Occident. Henry Pu-Yi, who became emperor of Manchukuo on March 1, 1934, as a by-product of the most recent of these endeavors to show the world, had abdicated in 1912 the throne which the Manchu dynasty had established at Peking in 1644.

It was of course on August 4 thirty years ago that Great Britain made good her word again by declaration of war on Germany the day following the kaiser's action against France and Belgium. That year saw the one-hundredth anniversary of the Treaty of Ghent, December 24, 1814, establishing a peace between the two great English-speaking nations which in this its 130th year is a greater bond than ever.

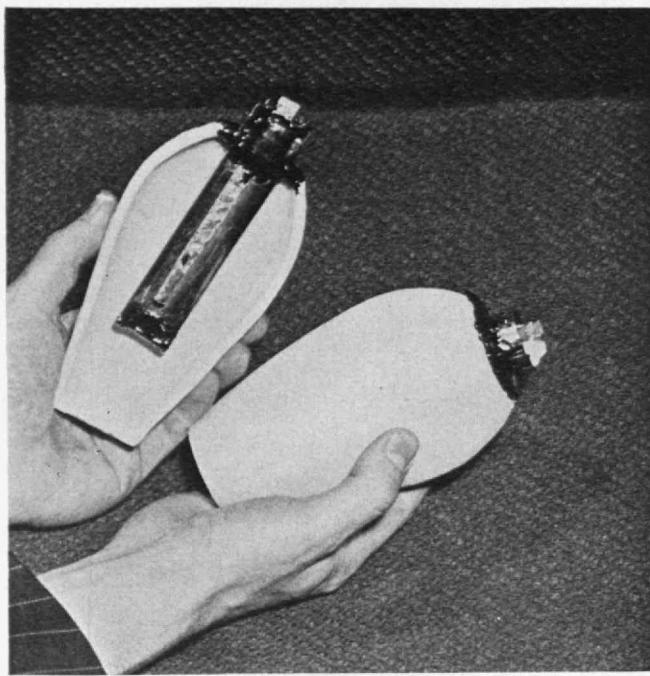
To turn from wars, many of the 366 days of 1944 will be signalized for happier reasons. Among them are April 25, date of the first two-way telephone conversation around the world, when Walter S. Gifford spoke with T. G. Miller in a near-by room in New York, the call being routed through San Francisco, Java, Amsterdam, London, and back to New York, 1934; August 15, opening of the Panama Canal, 1914; May 6, organization of an American company by Cyrus W. Field to

finance the laying of an Atlantic telegraph cable, 1854; May 24, completion of the first telegraph line by Samuel F. B. Morse, Washington to Baltimore, over which the first telegraphed news dispatch traveled the next day, 1844; June 15, patenting of his process for the vulcanization of rubber by Charles Goodyear, 1844.

Less narrowly defined are other anniversaries ahead. The idea of the military tank dates from 1914. To that year also are assigned by some annalists Brearley's development of stainless steel and Bergius' process for the manufacture of gasoline by liquefaction of coal. Ten years before, in 1904, J. A. Fleming constructed a practical electron tube. The year 1884 saw the first patenting of the linotype by Ottmar Mergenthaler and the commercial manufacture of the practical fountain pen invented by L. E. Waterman. Charles Parsons' steam turbine likewise dates from that year. Forty years before that, Uriah Boyden developed the first successful water turbine, in 1844, when John Mercer devised the treatment of cotton known by his name.

In 1804, Colonel John Stevens and his son Robert built and operated in New York Harbor an experimental twin-screw steam launch, the *Little Juliana*. Richard Trevithick in England had put steam to work that year in the first steam locomotive to run on rails. Twenty years earlier, 1784 was marked by the exhibition of a small experimental steamboat in Virginia by James Rumsey and by the appearance of the first American daily newspaper, the *Pennsylvania Packet and Daily Advertiser*, at Philadelphia. In the century before, Von Guericke's development of the air pump for the production of vacuum was accomplished in 1654.

In the world of ideas, 1774 is memorable for Priestley's discovery of dephlogisticated air — oxygen — and other gases; 1684 for Leibnitz' publication of his method of differential calculus. Of the numerous noteworthy birth years which will become another decade distant during 1944, the year 1564 is by far the most memorable: Art and science both owe it much, for it was the natal year



The Berkshire Museum

This is a model built to the specifications of mysterious vessels dating from some 2,000 years ago. With copper sulphate as an electrolyte, duplicates of the ancient device operate perfectly as galvanic batteries.

of William Shakespeare and Galileo Galilei. Physics and chemistry in 1944 will note the 120th anniversaries of Lord Kelvin, Wilhelm Hittorf, and Gustav Kirchhoff, all born in 1824.

Among the historical oddments which 1944 prompts remarking are that the first American newspaper advertisement appeared in the Boston *News-Letter* in May of 1704; that Lewis and Clark began their ascent of the Missouri on their memorable expedition to the Pacific in May, 1804; that head lamps became standard equipment on automobiles in 1904, and that the inclusion of bumpers as standard equipment came 20 years later.

As concluding item for this avowedly cursory catalogue, there is interest in the fact that the first trans-Pacific airplane flight, on May 16, 1924, was from Attu Island to Paramushira Island, and that it was made by three United States Army fliers.

The Ancients Had a Battery for It

By DAVID O. WOODBURY

IN a glass case in the Egyptian room of the Berkshire Museum at Pittsfield, Mass., there rests a strange little object made of pottery and metal which may change the whole concept of the birth of voltaic electricity. It is a modern replica of an electrolytic cell discovered a few years ago in the ruins near Bagdad. The find was made by Wilhelm König of the Iraq Museum. In the course of excavations in Khujut Rabu'a, southeast of the present city, the mysterious little vessel was brought to light in the summer of 1936. At that time its significance was not understood.

The pottery jar was about six inches high. Inside it was a copper cylinder closed at the bottom with a soldered plate. Within this were the remains of an iron rod, eaten down to a point at its lower end. Traces of asphalt around the neck indicated that the two metals had been

supported concentrically but insulated from each other.

While the mystery was in debate among the museum's scientists, four more similar jars were discovered at the excavations at Tel'Omar. Three of these proved to have the same kind of copper cylinder, though no iron electrodes were present. Iron and bronze strips were found near by, however, suggesting wires used to complete an electric circuit.

In 1938 the data and drawings of the ancient device were brought to Germany, and there they soon disappeared into the maelstrom of approaching war. Not, however, before several conjectural articles had been published in the technical press. Consensus was that the relics were an ancient form of the galvanic battery devised by Volta. The period assigned was some 2,000 years before the Italian professor made his invention.

Though the matter must remain pure speculation, the circumstantial evidence is rather complete. Dr. König was authority for the statement that there still exists in modern Bagdad a primitive art of electroplating with zinc, the origin of which is obscure. Numerous examples of ancient Parthian bowls and vases of copper, plated with gold and silver, are also to be found. No one has ever before discovered how the plating was done. Since one metal can most easily be deposited upon another, especially a dissimilar one, by electric current, it is a fair assumption that the ancients not only knew of electricity but understood how to make it and use it. The question of a suitable electrolyte would not have been difficult. Both acids and alkalis were probably then known.

Not long ago a German scientific writer, Willy Ley, brought to America the few facts concerning this important discovery. They interested him so much that he concocted around them a fictional story which was published in *Astounding Stories* in 1939 and subsequently picked up by various trade journals and digest magazines. In the meantime a London field museum party uncovered 12 more of the little pottery cells on the same site. Still others were unearthed at Ktesiphon soon after by scientists of the State Museum of Berlin. Since the latter cells were found with a number of objects of the Sassanian period, to date them back at least to the time of Christ seems reasonable. Further research may establish an even greater antiquity, for the ancients of that region are known to have plated objects with gold and silver as long as 4,000 years ago.

Dr. Ley's story came to the attention of Willard F. M. Gray, an electrical engineer at the General Electric plant in Pittsfield. Mr. Gray was so much impressed that he obtained all the data from Dr. Ley and, curious to see whether an ancient battery of this sort could have worked, built an exact duplicate. Using copper sulphate as an electrolyte, he found that the cell operated perfectly.

There the investigation rests at the moment. When the war is over, several museums will undoubtedly return to the site for further exploration, perhaps hoping to discover a whole electroplating unit intact.

If they do, what then? To know that the ancients used electricity will give us one more link in the chain of evidence that our much vaunted modern civilization is not quite so original as it thinks. A safer supposition is that in any age the people will be ingenious enough to provide themselves with the means essential to living a satisfactory life.

Power the Hard Way

THE Navy," says Rear Admiral Earle W. Mills, "believes that the gas turbine will be of great importance as a main propulsion drive in the future and is actively engaged in its development. . . ." Similar professions of faith are beginning to abound in the literature on the gas turbine, as well they might, for the prospects for this power producer, long based on theory, are now bolstered by a small but impressive list of successful applications. A locomotive driven by a 2,200-horsepower gas turbine is demonstrating its capabilities in Switzerland. A 4,000-kilowatt gas turbine unit has been delivered as stand-by capacity for the power system of the Swiss city of Neuchâtel. Gas turbine units with outputs in the thousands of horsepower have been running almost continuously for the past several years in certain American and foreign oil refining plants where large quantities of compressed air are needed to regenerate the catalysts by burning off the carbon which collects on them. The hot gases resulting from the combustion are used to drive the gas turbines, which not only drive the compressors but also furnish sizable amounts of power.

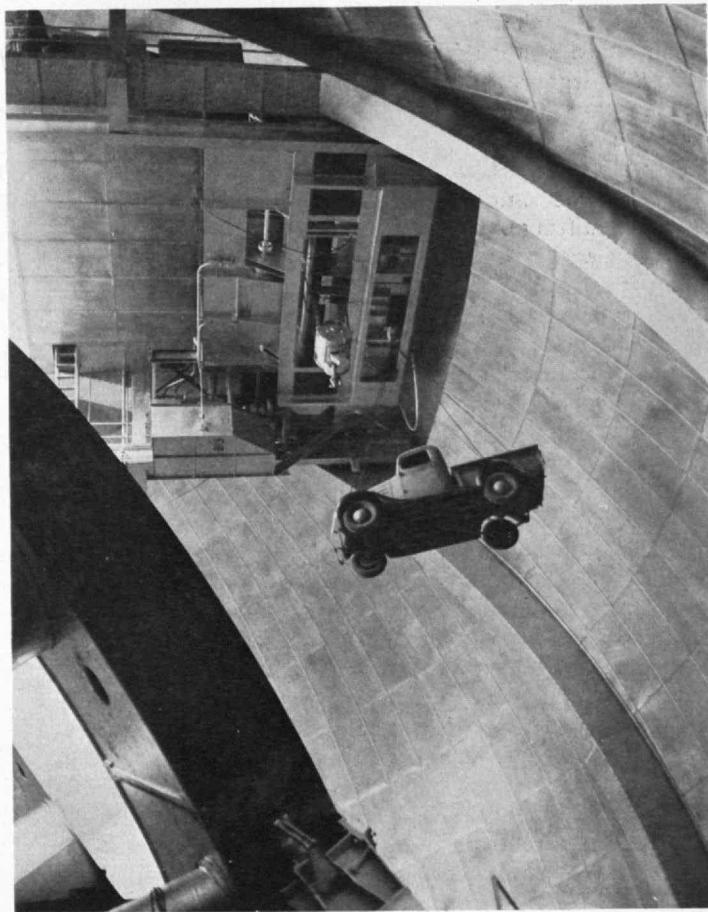
As far as total capacity is concerned, however, the most important immediate application of the gas turbine is in the superchargers of high-altitude airplane engines. Every Thunderbolt carries one of these gas turbines, every Lightning two, every Flying Fortress and Liberator four. Because of the great incentives involved, this application has spurred research on all phases of gas turbine and compressor design, and has demonstrated that the latest alloy steels can withstand, at least for limited periods, temperatures hundreds of degrees higher than is present steam turbine practice.

That the gas turbine retains the grip on the imagination of engineers which it has held for the past 150 years, most of them years of failure and frustration, was demonstrated in New York recently when C. Richard Soderberg, Professor of Mechanical Engineering at the Institute, and Ronald B. Smith, director of research and development of the Elliott Company, presented a paper on its possibilities as a marine prime mover. The group of naval officers, ship designers, and engineers who attended this session of the Society of Naval Architects and Marine Engineers filled every seat and stood in ranks along the walls. "Much of the available literature on gas turbines," said the authors, "has been premised on low efficiency. This defeatist attitude has developed to such a degree that it is now generally held that within the temperature limits of our available engineering materials it is impossible to produce a plant comparable in efficiency with existing prime movers. The prevalence of this misconception is unfortunate, and the authors wish . . . to take an emphatic stand against it."

The great virtue of the gas turbine is simplicity. As prime movers go, it has few components; it is cheap to build; it is light, potentially lighter than any other form of engine except an out-and-out rocket or jet propulsion engine. Provided the limitations of its materials are not exceeded, it is expected to have the reliability, long life, and low lubricating-oil consumption which are characteristic of the turbine class of machinery. Until recently, however, most attempts to exploit these advantages have foundered on the rock

of low efficiency. Thermodynamically, the gas turbine is a hot-air engine. Air under moderate pressure, generally lower than 100 pounds a square inch and often much lower, is used to burn a suitable fuel. The energy in the hot gases of combustion is then drawn on by the direct but hard way of their being passed through a turbine, the nozzles and buckets of which are thus exposed to the heat and corrosive action of the gases. In order to cool these gases to a level fixed by properties of the available materials, a large excess of compressed air is injected into the combustion chamber, which lowers the thermal efficiency of the turbine and increases the load on the compressor. Driving this compressor is the turbine's first job, and the difference between the output of the turbine and the power absorbed by the compressor is substantially the net, or useful, power. A good present-day turbine might deliver 600 horsepower to the compressor for every 400 horsepower of net output.

Because the useful power is a difference, it is exceptionally sensitive to the efficiencies of the components in the cycle. For many years the difference was virtually zero, and the best that inventors could do was to build a plant that barely turned itself over. Progress in metallurgy and in the art of building rotary compressors has been mainly responsible for improving that situation. The gas turbine, because it rotates continuously and at high speed, demands some rotary form of compressor, of which there were no efficient types in the Nineteenth Century and the early years of the Twentieth. Today the



Ted Watterson

By way of contrast with the reminders of ancient science opposite, here is vivid demonstration of the scope of a modern project unfinished — a truck hoisted into the dome of the observatory on Mount Palomar, where completion of the 200-inch telescope awaits return of peace.

designer can choose from several forms with efficiencies over 80 per cent. Moreover, the multistage axial-flow compressor has exceeded efficiencies of 83 per cent.

Even more important in broadening the scope of the gas turbine has been progress in high-temperature steels, for as the inlet temperature goes up, less cooling air is needed and the turbine can extract more energy from every pound of gas passing through it. The difference grows from both ends, so to speak, and over-all efficiency may rise twice as fast as does the temperature. In the gas turbine locomotive previously mentioned, a thermal efficiency of about 18 per cent at three-quarters of full load was obtained. But the engine was built in Switzerland during the present war, and the difficulty of obtaining high-alloy steels (a factor hindering the gas turbine program in this country also) restricted the inlet temperature to 1,112 degrees F. Had the inlet temperature been 1,500 degrees F., it is estimated that the thermal efficiency would have been almost doubled. Soderberg and Smith believe that thermal efficiencies of 30 per cent or more are immediately attainable with gas turbines operating at inlet temperatures of about 1,200 degrees F. With present materials, such turbines should show the same degree of reliability as existing steam turbines operating at 900 degrees F. If and as the gas turbine becomes capable of operating on the cheaper fuels, it may well become a competitor of the Diesel and steam turbine even for base load power.

That a temperature of 1,200 degrees F. is a conservative design figure is shown by the performance of gas turbine superchargers which must operate for long periods on exhaust gases ranging in temperature from 1,200 to 1,700 degrees F., with 1,500 degrees widely quoted as an average figure. Most parts of a turbine of course operate at levels considerably below the inlet temperature; nevertheless, the use of metals under such conditions may be compared, in Soderberg and Smith's words, "to the shifting to a brittle material like cast iron for the buckets and rotors of conventional turbines at lower temperatures."

In contrast to the mutation which, like the incandescent lamp, goes virtually in one jump from the laboratory to commercial success, the gas turbine can serve as an almost classic example of the type of technical evolution that proceeds so slowly and by such small steps that, when practical forms of importance are finally achieved, engineers can't quite believe it. Time was when only calculations separated the gas turbine from the class of perpetual-motion devices. Recently, Professor Jerome C. Hunsaker, '12, declared that the gas turbine was one of the three reasonably possible developments which might radically and rapidly change standards of airplane performance. The reciprocating engine has for a long time clung to the plateau of roughly one pound of weight per horsepower. The gas turbine offers hope for a considerably lighter engine. In marine and rail transportation also, the gas turbine offers the possibility of replacing complex and highly developed engines with mechanisms that are light, cheap, simple—and hard to design. The metals and compressors that have made possible the present stage of the gas turbines are available for use in other prime movers, but for various reasons the others do not stand to gain as much relatively as has the gas turbine. The old order changeth, yielding place to new.

The Institute made preparations nearly two years ago to do its proper share in assisting that change, through the naming of a committee by Edward L. Moreland, '07, Dean of Engineering, to survey the problems and possibilities presented by the gas turbine. Under the chairmanship of Professor Soderberg, the committee—comprising John Chipman, Professor of Process Metallurgy; Hoyt C. Hottel, '24, Professor of Fuel Engineering and Director of the Fuels Research Laboratory; Joseph H. Keenan, '22, Professor of Mechanical Engineering; Charles W. MacGregor, Professor of Applied Mechanics; Frederick H. Norton, '18, Professor of Ceramics; and Edward S. Taylor, '24, Professor of Aircraft Engines—resolved the fundamental problem into a group of component questions. Subsequently, the committee has become a joint interdepartmental one under the chairmanship of Professor Hunsaker, with Professor Soderberg as vice-chairman and Dean Moreland or Robert S. Williams, '02, Deputy Dean of Engineering, serving ex officio as member. Thus far, the combustion problem has been the main focus of study, and considerable progress has been made on various phases of it. Analytical studies of turbine cycles, of compressors and turbines, and of fracture, fatigue, and creep of materials constitute other phases of the work projected. It is anticipated that as war demands lessen, constantly increasing effort will be applied to the vigorous prosecution of a program of co-ordinated research in the field.

Plague in the United States

TO most people, the plague seems one of those terrible diseases of distant countries which we never expect to encounter if we stay at home. It seems to come as rather a shock that plague has occurred regularly in the United States for more than 40 years. It has been continuously present since 1900 in western United States, and the evidence is that it is not merely going to remain with us but is going to spread more and more. In the early years of this century (1900–1908), nearly 300 cases appeared in the area around San Francisco and a few others elsewhere along the Pacific Coast. It did not begin to spread eastward, however, until about 1930. Fortunately, no serious outbreaks have occurred for a good many years, though there was one in Los Angeles in 1924. In view of these relatively rare occurrences in man, how can we say that the plague will remain with us?

Plague involves four sets of living organisms: man, whom we think of as the important victim of the disease; a bacillus (*Pasteurella pestis*) which actually causes the disease; various rodents which, like man, are victims of the disease and which keep it going outside of man; and, finally, an assortment of fleas which carry the bacillus from one victim to the next.

It is clear, then, that if plague is present in rodents (we call it "sylvatic plague"), it always stands a chance of being passed on to man. The United States Public Health Service traps wild rodents extensively and tests both the rodents and the fleas for infection with plague. As a result of the health service's work, we know that plague is present very extensively in coastal California from San Francisco to Los Angeles; less extensively in extreme northern California, northeastern Oregon, and southwestern Montana; and, more scatteringly, in all the states west of the eastern (Continued on page 166)

Aviation After the War

Airy Utopias, Objectively Scrutinized, Are Found Likely to Remain Just That for Some Years

BY S. PAUL JOHNSTON

The term "postwar" is very loose. It can mean almost anything. What most of us mean, however, is the immediate future, the first few years after the final windup of the present war. Five to ten years would be a reasonable figure. In the discussion which follows, that is what will be meant by the "postwar era." The probable developments of the first five years can be predicted quite accurately. The trends for the second are already discernible. — S. P. J.

ADVERTISING copy writers, Sunday supplement artists, and the long-whiskered prophets of the science-made-easy school have handed the people of America a magnificent Easter egg — one of those sugar-decorated shells in which they can peer at a pasteboard fairyland. Inside is pictured the dreamworld of tomorrow — glass and plastic houses, superspeed elevated highways, skies full of aircraft. With eye glued to the glass, many regard this *Futurama* as close enough to grasp.

It is quite possible that the cities of the future will look like the World's Fair concept of 1939. Automobiles of the future *may* look like torpedo-shaped projectiles. Aircraft of the future *may* look like Buck Rogers' space ships,

But —

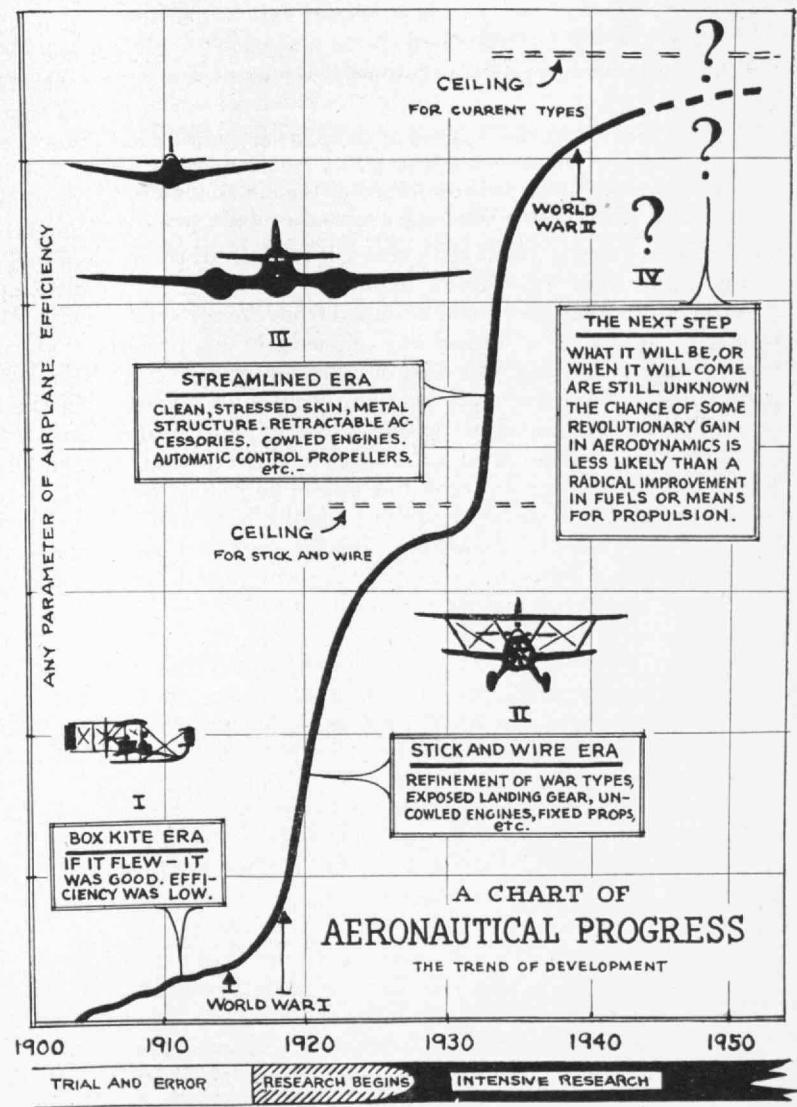
Those of us who survive the present war with an expectation of seeing for ourselves the events and the changes of the next ten or a dozen years had better back away from the peephole and take a look at the things that lie between us and the Promised Land. It may not be quite so near as it seems.

We are now experiencing a throwback into a Victorian state of mind. In the late 1800's, when scientific development had approached a point where flight for man seemed within reach, the wildest sorts of imaginings were committed to paper. Voyages to the moon and other journeys into interstellar space became common subjects for drawing room conversation. But after the Wrights, Curtiss, and other practical men had demonstrated to the world that flight was actually possible, the average man accepted the airplane with reservations. "It ain't safe!" was common comment. Even by 1918 the airplane had not established itself as a practical vehicle. Few people looked upon it as anything but a new and exciting kind of military plaything which required more heroism than good sense to manipulate.

Now, the airplane has proved its value as a peacetime carrier of commerce as well as a weapon of war. Aviation has ceased to be a game. It has outgrown the emotional instability of adolescence and has emerged as a new and completely

practical mode of transportation. It is destined to play a tremendously important part in our postwar world.

But curiously enough, intermingled with today's hard-headed business and engineering approach, popular imagination is again tending to outrun probabilities. Many people seem to believe that a great and new discovery will spring full-blown from the brain of some genius to lift the level of aviation's possibilities far beyond present limits. This may well be so, but it is far safer to assume that aviation will continue to grow and to develop along now familiar lines. New designs and improvements are definitely in sight. At the moment, however, no magic formula is in evidence, no "Open sesame" has yet been spoken to swing wide the doors to a dreamworld. To the layman, the practical ceilings that are clearly discernible



to the aerodynamicist and to the engineer simply do not exist. Once again we are off for the moon.

In that fantastic World of Tomorrow which many believe will emerge at the coming of peace, the skies are black with layer upon layer of strange aircraft. At the lower levels, the commuter goes to work, the milkman delivers milk, and the newsboy drops the morning paper on the doorstep by helicopter. Higher up, interurban helicopter busses filled with shoppers and sight-seers pinwheel back and forth. On other levels, batlike planes shuttle between distant cities, and glider trains shift their loads in aerial switchyards. Highest of all, the stratosphere liners, spouting flame and smoke from rocket engines, roar on services transcontinental and transoceanic.

To the layman in aeronautics such things seem quite plausible. He has read all about them in the papers. He has been well fed on the manna showered down by the glamour boys. For example, this from a recent Sunday magazine article:

Vacation, 1950: Your bag is packed . . . you step . . . into your helicopter, you start the motor and the windmill overhead lifts you into the air. You fly over to the airport, park the helicopter, buy your ticket, and get aboard the commercial plane. . . . But what a plane! Accommodating 200 passengers . . . it might be a metal reproduction of some flying reptile of the age of dinosaurs. . . . Commodious, luxurious quarters, comfortable lounge chairs, a restaurant and observation cabin. . . . No more "street car" seating arrangements. . . . This is how you will fly after the war. . . .

Or this from a broadside of a famous news magazine:

Dear American:

Are you keen to see the wonders of the postwar world? Are you interested in an America where . . . you can catch a helicopter taxicab, pilot your own Ford of the air . . . fly in luxury from New York to London for a hundred dollars? . . .

the promise being implicit that you will read of all these things before your subscription expires!

A dozen more samples could be culled from the editorial or advertising pages of almost any magazine. Such post-war scenes are exciting. The idea of a helicopter in every garage has a definite appeal. And who would not like to picture himself comfortably ensconced in a flying wing for a quick visit to London at a hundred dollars a head? These *may* be postwar pictures, but more likely they are *post the next war*. Unless the present conflict lasts much longer than we think, immediate postwar years are far more likely to resemble the immediate pre-war years than they are the fantastic picture just outlined.

The reasoning is not hard to follow.

Take any parameter of aviation progress which comes to mind — aircraft efficiency, utility, or what not — and sketch a curve against a time scale, as in the chart on page 137. From first flight (1903) to about 1915, improvement was slow and irregular. World War I touched off a skyrocket rise in the curve, which persisted with minor variations into the late Twenties. Then a ceiling was approached. There was just so much "in the wood" for the then basic type. Thin-winged biplanes with exposed bracing could go only so fast. There was too much drag in struts and wire. Fabric wing covers would not stand the gaff. Openwork engines and fixed-pitch propellers reached a limit in over-all effectiveness.

As a direct result of the application of research, the stick and wire multiplane gave way almost overnight to the much more efficient stressed-skin, highly streamlined

monoplane that is in universal use today. The completely cowled engine, coupled through reduction gears to a slow-turning, controllable-pitch propeller, yielded propulsive efficiencies unattainable before. Power-consuming drag was reduced to a practical minimum by the elimination of wires and all other excrescences. Landing gears were folded away when not in use. Landing lights and other exposed gadgets were built into wing or fuselage contours, or were made retractable in flight. Junctions of wing and tail surfaces with fuselage were studied carefully and filleted to induce smooth air flow and to reduce interference drag. Even the rivet heads that originally pimpled the skin of the early all-metal planes were lopped off to make surfaces as smooth as practicable. Wing flaps and other so-called high-lift devices permitted increases in wing loading to be made with safety that had been undreamed of.

The cumulative effect of all these things tore a hole in the ceiling of the late Twenties and bent the rate of progress curve sharply upward.

Presently other limiting physical factors began to be felt. A new ceiling was in sight. Wing loadings, even with the best of the known lift-augmenting devices, shortly reached a point where safety again became marginal. Limitations in controllability became apparent. On the structural side, the best of the aluminum, magnesium, and steel alloys known to metallurgy can safely be stressed only so far. The best of the fuels and oils known to the chemical sciences will produce just so much energy or will withstand just so much friction load without breakdown in engines as we know them today. And for some reason not yet entirely clear, most aerodynamic phenomena reach a critical point at speeds approaching the velocity of sound, about 750 miles an hour. Once past that point, smooth air flow, on which the lift of wings and the bite of propellers depend, breaks down and a violent turbulence develops which may wrench the strongest plane to bits in a few seconds with explosive force.

Of course, no airplane today is flown at anywhere near the speed of sound, except possibly in a full power dive in the hands of a test pilot. The best pre-war racer did about 440 miles an hour in level flight. Some current pursuit planes can do better than that at extremely high altitudes. Five hundred miles an hour will be possible before long, but that speed will probably be "tops" for quite a while. The catch lies in the fact that the actual velocity of air flow over certain parts of an airplane in flight may be much greater than the speed of the plane itself. Propeller tips are good examples. At the leading edges of wings and over the tops of windshields, air speeds are also likely to be extremely high. Once the speed of sound has been exceeded, even locally, strange things begin to happen. So-called shock waves, followed by a compressibility "bubble," may develop, which upset all calculations and which tend to tear things apart.

Such phenomena impose a wholly new set of ceilings on airplane design. As an airplane becomes more and more efficient, the rate-of-progress curve tends to flatten out. A regime of diminishing returns sets in. Tremendous effort yields small gain. In the years when the curve was pitched steeply upward, a relatively short time interval yielded relatively great advance. Now, for the same time interval, despite expenditure of tremendous effort the increment of advance is small. It will become progressively smaller until something (*Continued on page 150*)

Meet Tarsius

*Man's Most Distant Ancestor,
Distinguished Genealogically,
Is Interesting Personally*

BY M. F. ASHLEY MONTAGU

AMONG the most interesting, and undoubtedly least known, members of the order of mammals to which man belongs — the Primates — are the tarsiers. Tarsius, so called because of the strikingly elongated tarsal bones of its feet, is little known for a variety of reasons: In the first place, it is often regarded as an exceedingly rare creature even by the natives who live in the regions where it occurs, namely, in Sumatra, Java, Bangka, Billiton, Borneo, Celebes, Salayar, Sangir, Bohol, and Mindanao. (This rather restricted distribution of Tarsius is in itself rather interesting: Observe that it lies between the 110th and 130th degrees of longitude, 18 degrees to the north and 10 degrees to the south of the equator.) In the second place, in many of the localities where it occurs, Tarsius is looked upon with superstitious reverence by the natives, so that they are not anxious to capture specimens. In the third place, Tarsius is a nocturnal animal, sleeping during the day and becoming active only at night; hence expeditions made during the night are alone likely to be successful in getting a sight of the animal, and such expeditions are not relished by the natives. In the fourth place, tarsiers when taken alive have not done very well in captivity, for they are very delicate little creatures; in fact, until very recently those examples that have become known to zoologists have been dead specimens immersed, often for many years, in a preservative fluid.

You have no doubt seen a rat after it has been immersed in water; well, that is what Tarsius has looked like to most zoologists — like nothing more than a drowned rat. It is for this reason, I suspect, that the creature is so often described in the textbooks as being about the size of a small rat. Actually, except for size, the living tarsier has not the slightest resemblance to a small rat. The photographs accompanying this article will give you a better idea of Tarsius than any description could. The examples shown in these photographs are fully adult living ones which were captured for and kept by John E. Eckman while he was living in Mindanao in the Philippines. Mr. Eckman was good enough to obtain four of these little creatures for my anatomical studies. The first living specimens to reach this continent since Eocene times, a mature female and a young male, were brought to this country by Mr. Eckman in 1938 and were flown to New Haven. These two tarsiers, possibly mother and son, have thrived under the sympathetic care of Professor John F. Fulton and his colleagues of the physiological laboratory at Yale University. In due course the observations which have been made upon these little-known animals will fill one more large lacuna in our knowledge of man's relatives.

The structural characteristics of Tarsius are so peculiar that systematists have classified it in a suborder all by itself among the Primates, the Tarsioidea — the first of the



John E. Eckman

primate suborders being the Lemuroidea, and the third the Pithecoidea, which includes the Old World and New World monkeys, the anthropoid apes, and man.

The tarsiers are represented by a single living genus, *Tarsius*, and although some seven different species are supposed to exist, we know so little about the genus as a whole that it is at present quite impossible to say whether there exist any more than the single species familiar to zoologists, namely, *Tarsius spectrum*, or the spectral tarsier (spectral because it has such huge eyes). Some fifty million or more years ago, in Eocene times, at least 21 different genera flourished, more than half of them in North America. These fossil genera, comprising the single family Anaptomorphidae, are known from European as well as from American deposits; recent studies have shown that the existing tarsiers have survived to the present time with very little structural change. For this reason *Tarsius* has justly been called a living fossil and probably the oldest mammal now inhabiting the earth.

Reader, look upon him with the respect he deserves; while you as a member of the human species may be able to trace your ancestry back a million and a half years, *Tarsius* by the most conservative estimate can trace his ancestry back at least fifty million years! But there is a still more pertinent reason why *Tarsius* deserves our respect: Scientists are generally agreed that among primates he stands as the most distant ancestor in the direct line of man's descent. In spite of superficial appearances, the resemblances of *Tarsius* to man are very striking, so much so that one distinguished authority, Professor Wood Jones, has gone so far as to claim that in the line of direct descent, *Tarsius* is more closely related to man than are any of the great apes. Other students of the subject, however, do not accept this view but believe instead that all the evidence strongly suggests that *Tarsius* represents one of the earliest, if not the earliest, of primate forms. The mammals most closely resembling the primates that are generally agreed to stand at the base of the

primate stem — the stock from which the primates sprang — are the tree shrews (Tupaiidae) of the order Insectivora. They so closely resemble primates that some systematists and morphologists have actually brought them into the order of Primates, which fact shows how narrow the border may be between one order and another. However this may be, there is no doubt that the tree shrews are very closely related to *Tarsius* not only structurally but in their behavior and habits as well. Thus, the tree shrews are almost exclusively insecteaters and so too are the tarsiers. Another interesting likeness between them is that the fossil and the living members of both groups have much the same geographic distribution. In the geologic time scale, tree shrews appear before tarsiers, namely, in the Cretaceous period of the Mesozoic era, and thus in every way they make excellent ancestors for the tarsiers. *Tarsius*, therefore, would appear to enjoy the honor of being that form in the animal kingdom which remains as the living link between the nonprimate mammals and the primates. It is a very distinguished position to occupy on the genealogical tree, and for this reason, as for the qualities which have enabled it to survive so long, *Tarsius* deserves to be better known and honored.

A fully grown tarsier measures about four to five inches (excluding the tail) and weighs about seven ounces. It is therefore the smallest of the primates. The scantily covered, rather ratlike nonprehensile tail is tufted at the tip, but the hair on the rest of the body is quite thick and is a gray brown in color, the tip of each hair being reddish brown and the base being blue gray. The somewhat batlike ears are bare on the inner surface and almost bare on the outer surface, while the skin on the inner side has a

number of crisscrossing, wavelike folds. The function of these folds is at present not understood; though they may have something to do with picking up sound more easily, the tarsier's sense of hearing is not known to be particularly acute. More probably they are related to the animal's ability to fold the upper part of its ears in such a manner as to reduce their area considerably and bring them close to the side of the head. When the animal is listening intently, the ears are widely opened and are moved back and forth, one pointing to the front and one to the rear, alternately.

The most striking thing about the tarsier is its huge eyes. The sockets giving support to the eyeballs extend laterally to such an extent that they have been described as giving the animal the appearance of wearing aviation goggles. This condition is even more true of the skull, which seems to be all orbit. The eyes, according to anatomists who have made studies of them, are capable neither of conjugate movements nor of stereoscopic vision, but at the side of the entrance of the optic nerve into the eyeball there is a slightly differentiated area which undoubtedly represents the beginning of the "blind spot" that renders stereoscopic vision possible. *Tarsius* is the first primate to exhibit this character.

Since *Tarsius* is a nocturnal animal, its vision during daytime is very poor, its pupil being reduced to a pin point. At night the pupil enlarges to such an extent that only a very narrow rim of brown iris can be seen around it. Colonel George Chase Lewis, who has kept more than one tarsier as a pet in the Philippines, says of one of them that "the eyes possessed great mobility and rolled widely sidewise and vertically in their sockets, exposing great

expanses of white eyeball in the faint light in a way reminiscent of a southern pickaninny hearing a ghost story. A more weird and ghostly countenance than that of the tarsier could not be found outside of a witch's family album."

And ghostlike indeed is *Tarsius*, for those eyes of his tell perhaps the most important story that can ever be told out of the far distant past of man's beginnings. In those eyes, in their size and position — for now they are no longer on each side of the head, as in other mammals, but boldly out in front — we see the development of the dominance of the sense of sight and the retrogression of the sense of smell. *Tarsius* has a poor sense of smell, and his brain is no longer an olfactory but a seeing brain. The importance of this change cannot be overestimated: Once it had occurred, no longer did one have to keep one's nose to the ground in order to make a living. Changing from a terrestrial to an arboreal existence is essentially correlated with the necessity to *see* rather than to smell, for one cannot catch insects on the wing by smelling for them but only by looking for them. And when one sees them, one must be able to catch them; therefore one's forelimbs must be freed for the task.

All these important changes in the evolution of the primates can be read in *Tarsius*, and that is another reason why the creature deserves to be better known by all of us. Unfortunately, the tarsiers are such delicate creatures, and so rare, that it is not yet possible to exhibit them in zoological gardens. (Concluded on page 154)



John E. Eckman

"... A more weird and ghostly countenance than that of the tarsier could not be found outside of a witch's family album. . . ."

Conversion and the Confederacy

*In the Production of Munitions the South Scored a Success
Despite Handicaps Dwarfing Our Recent Worries*

BY GEORGE FORT MILTON

ACCOUNTS of the life and death of the Confederate States of America place great emphasis upon the breakdown of the economy of the seceded states, the fatuous operation of its railroads, and the ravages of an almost astronomic currency inflation. All of these, of course, are indisputably among the principal causes of the failure of the second American revolution. But they tend to obscure one extraordinarily efficient operation of Southern supply — that of munitions of war. This was outstanding, not only in contrast to the worse than indifferent handling of food procurement for the Confederate armies but even more in relation to the munitions problem itself. Aside from triumphs of the contest in arms, it represents perhaps the high point of Confederate defense achievement.

All through 1941 and in much of 1942, we Americans were talking about the difficulties of "conversion," but these difficulties were small compared to the problems which faced the South at the outset of the Civil War. The conversion we had to plan and execute in the last two years was, after all, that of an economy fundamentally industrial. We already had a frame of reference in an elaborate and efficient technological producing plant. We were disturbed by the need to adapt old tools and processes, or to contrive new plants, tools, and skills to produce great volumes of matériel for war. But the South had to make just about a total conversion to an industrial society and economy from a way of life which from the beginning had been predominantly agricultural.

The Confederate States had no such breathing spell of time as we had between Germany's invasion of Poland on September 1, 1939, and the passage of the Lend-Lease Act on March 11, 1941. At the most, the Southern revolutionaries were able to shape their plans to prepare for the looming conflict no earlier than June, 1860, when the Democratic National Convention at Baltimore split in two and Abraham Lincoln's election was foredoomed. Most of the principal fire-eaters, however, would not recognize the immediacy of the change of Federal control until Lincoln's actual election in November, which catalyzed South Carolina into leading the secession parade.

*Making gun carriages in the Tredegar Iron Works near Richmond—
from an old print*

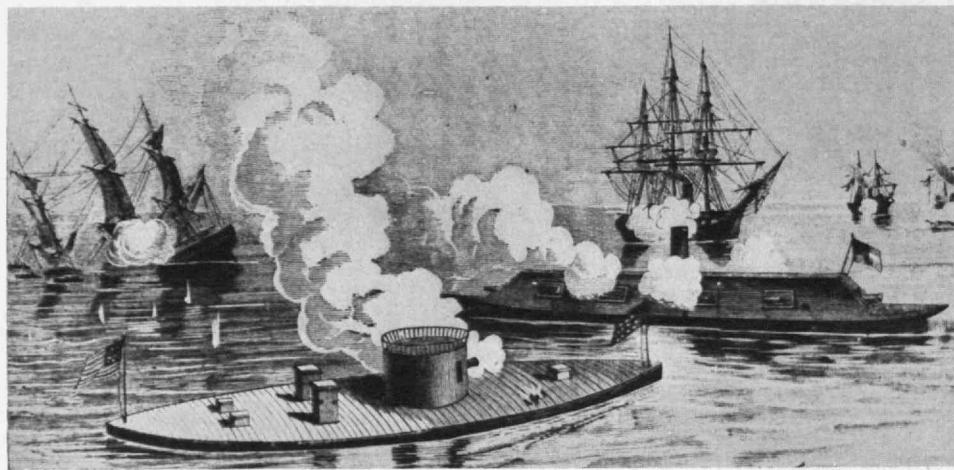
The new government was formed at Montgomery, Ala., early in February, 1861. President Jefferson Davis and his cabinet advisers clung to the illusion that what was left of the United States of America would follow the advice of the erratic Horace Greeley to let the erring sisters depart in peace. Lincoln's expedition to relieve Fort Sumter in Charleston Harbor shocked the Confederate command into the reluctant realization that independence would have to be won on the battlefield. In three months' time, secession dialectics were at heavy discount and the sword had become the arbiter.

The contrast between the economies of the antagonists was striking. The Fifties had been a period of extraordinary economic change throughout the United States. In 1850, some 22,000 miles of telegraph lines were in operation, but during the decade 38,000 miles of line were built, three-fourths of that north of the Potomac and Ohio. Of 1860's total railroad mileage of almost 31,000, the South had less than a third. New York and Pennsylvania together had invested more money in the iron horse than had the 11 Southern States.

Even more startling contrasts were presented in the field of manufactures. In the year of Lincoln's election, the North employed about 1,300,000 industrial workers, the South only 110,000. The Northern "value of annual product" figure for that year was \$1,750,000,000, and that for Dixie a meager \$145,000,000. There were 110,000 manufacturing establishments in the North, and only 18,000 in the South. The census takers had not found in the states soon to secede a single manufacturer of furni-



The Bettmann Archive



The Bettmann Archive

The first battle between ironclads: the Monitor and the Merrimac engaged on March 9, 1862. Raising and reconditioning the Merrimac were John Mercer Brooke's first major duty as a commander in the Confederate Navy.

ture, clothing, rubber goods, jewelry, or musical instruments.

Only 20 of the country's 206 illuminating-gas plants were in the South. The woolen industry's production had been about \$69,000,000, but only about 3 per cent of it was southern. Of the boot and shoe industry's \$89,000,000 output, a little more than 2 per cent was southern. Cotton might be king, but New England produced three-fourths of the cotton goods, and the South's textile plants only about one-fifteenth. In lumber, a low-skill process, the South turned out less than a fourth of the output of the Loyal States. The largest product value among the nation's industries was that of processing flour and meal. Here the Southern States were credited with \$30,700,000, out of a national total of \$223,000,000.

The heavy industries are always basic for the supply of actual military matériel. The South had enormous undeveloped natural resources, but her processing record was absurdly small. The best showing was in copper, in the Ducktown basin in southeastern Tennessee; in 1860, the South produced about 40 per cent of the domestic yield. A little lead was mined in Virginia. Neither zinc nor nickel was mined anywhere in the South.

Northern coal production was 140,000,000 bushels. This contrasted with 13,000,000 in the South, concentrated in Virginia, Georgia, Tennessee, and Alabama. The South had not followed the North in turning from the use of charcoal to that of coal in ironmaking. The hot-blast process had been applied to the treatment of iron ore and scrap in 1834, and anthracite soon began to replace charcoal as iron furnace fuel. But the South did not follow. This helps explain why, out of a national smelt of over 850,000 tons in 1860, only 27,000 tons of pig iron were produced in the South. Of bar and rolled iron, the South produced 24,000 tons, the North 382,000; of iron founding, the South \$2,500,000 and the North \$24,000,000. The locomotives used on Southern railroads were imported either from the North or from Europe. The cast-iron rail and two-thirds of the railroad roundhouse staffs came from the North.

When the war broke out, the South had only two rolling mills capable of rolling an iron rail or a ship plate. One was the soon-to-be famous Tredegar Iron Works at Richmond. The other was a plant at Nashville. After the fall of Fort Donelson in February, 1862, the Confederate authorities moved its equipment out of Federal reach, and from then until the end of the war it was shifted hither and yon over the South.

There was only one machine shop in which a steam engine could be manufactured. Not a single Southern shipyard could essay any more ambitious engine task than minor marine-engine repairs. The Confederate States had no chemical industry, and few well-equipped college laboratories. There was but a single powder works and no laboratory for making fulminate of mercury for percussion caps. Railroad repair shops were woefully inadequate. Rail manufacture was undertaken reluctantly, and before long the Confederate Government found itself forced to rob an existing road of rails in order to build a militarily essential railroad connection from Greensboro, N. C., to Danville, Va.

Such was the situation which confronted the Confederacy at the outbreak of the war. The Davis government did not realize its full gravity for some months but preferred to gamble on the theory that "cotton was king" and that the great cotton-using powers abroad would break the Union blockade to replenish their stocks of the fleecy staple. But both England and France had heavy supplies in their warehouses. Neither power challenged the blockade in a resolute fashion until it had changed from little more than Seward's paper proclamation to a surprisingly effective sea force from Hampton Roads, Va., to the Rio Grande.

Stocks of arms and ammunition on hand in United States arsenals and armories were seized by the new government. Late in 1861, efforts were made to import artillery, small arms, ammunition, and other essential matériel. But these imports by blockade-runners were "too little and too late." The Confederacy was confronted with having to improvise its own plants and to train its own skills to manufacture the essential tools of war. And there was response—not of Davis or his cabinet but of some theretofore unknown geniuses of discovery, invention, and production skill. This is not to be wondered at. More often than not, the pressure of necessity on minds of a high order leads to extraordinary results.

Perhaps the outstanding performer was Josiah Gorgas, the chief of ordnance of the Confederate Army, who showed real genius in keeping the troops supplied with arms, ammunition, and other essential material of war. Gorgas, whose ancestry was Dutch, was born in Dauphin County, Pa., in 1818. He secured appointment to West Point and was graduated in 1841, close to the top of his class. He was assigned to Army Ordnance and in 1845 was sent on a mission to (Continued on page 156)

Fabrics of Our Fathers

Language in Many Ways Records the Linking of Cloth with the Progress of Civilization

BY EDWARD R. SCHWARZ

WHETHER it serves as a parachute in the air or to carry air itself far underground in ventilating tubes, fabric guards the safety of the aviator and the tunnelworker alike. For generations it has ministered to our comfort, appearance, and modesty until, taking for granted the presence of fabrics of all sorts, we have ceased to note the romance of their early history and of their steady development. We fail to comprehend how closely textiles have been associated with the growth of civilization. We fail to appreciate that today we are benefiting from one of the most ancient arts known to man.

The trailing and twisting lianas of the jungle may have taught our ancestors in bygone centuries how to spin, but the art of producing a knitted fabric is mankind's achievement alone. It would be hard indeed to find in nature a woven or knitted material. Cloth, then, is one of his developments of which man may well be proud. A fabric lends itself to artistic blending of colors, as does a picture. More than this, it affords to the artist the same opportunity as does sculpture, allowing work in three dimensions. The draping qualities of fabric are unique and have been widely used to beautify both ourselves and our surroundings. This property allows the skilled user to enhance or to conceal the lines of form or figure as he wishes. A fabric is responsive to any mood of the designer, clinging or billowing according to his desire. Schools of art have been based on the rendition of fabric draping.

Fabrics are used not only as clothing but as ornamental tapestries, rugs, laces, and embroideries. Nor are these usages modern ones. The ancient Peruvians have left us

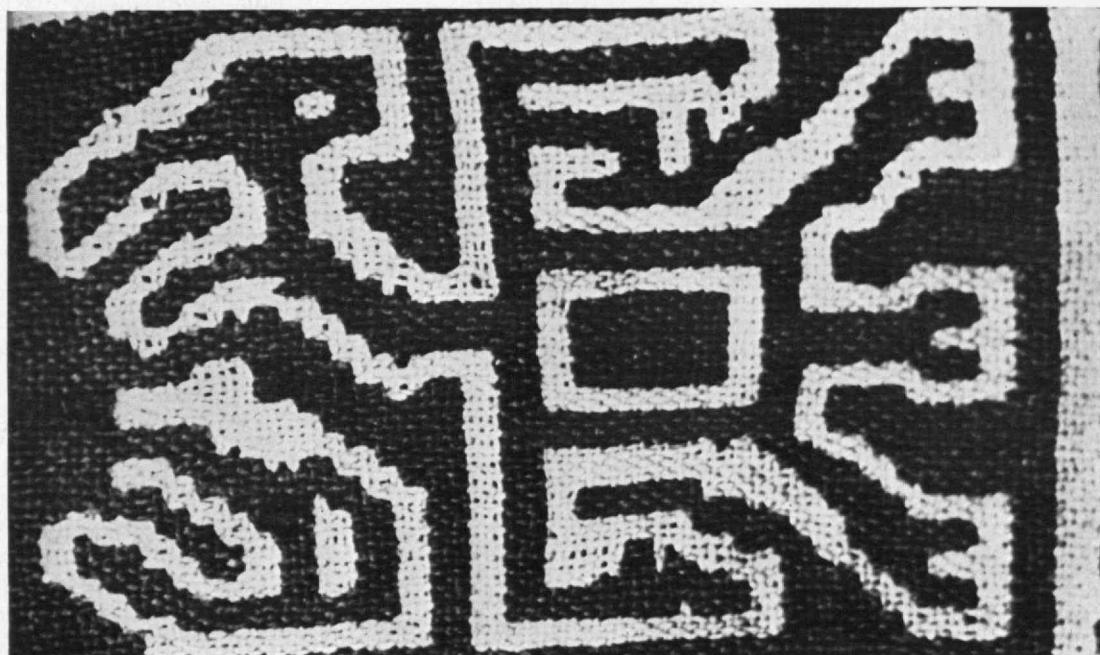
a diversified fabric record — double fabrics, lenos, pile fabrics, tapestries — all made with the utmost delicacy of technique and even brilliance of color. Such mature skill could have been attained only over vast stretches of fruitful time, which certainly extend back to periods far preceding the Spanish invasion.

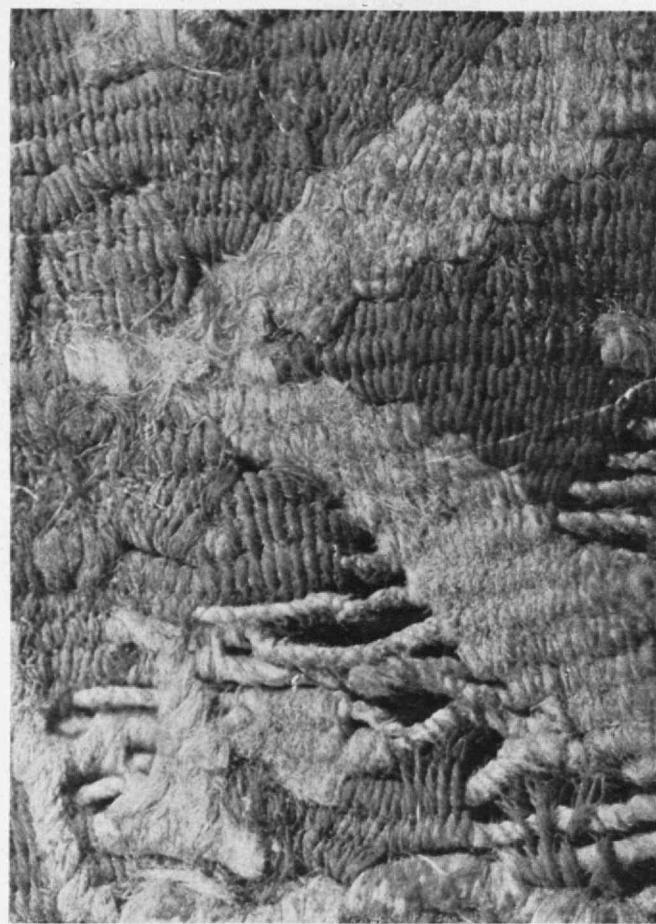
As in America; so also in Asia, the roots of textile endeavor were firmly founded from the earliest times. Looms existed all over the world, from the shores of the Mediterranean to the foggy islands of the Bering Straits, in India as in Peru. In the story of their development from a series of vertically supported strands, weighted sometimes with human skulls; from the web stretched across a hole in the ground, on the edge of which the weaver sat; through the Chinese drawloom and the Jacquard loom; to the automatic loom of today, the story of the rise of civilization can be read.

The art of spinning was in large measure responsible for man's advance to a nobler civilization. It was also something of a leveling influence, continually working in an age when noble and serf were as widely separated as Kipling's East and West. But whether of high birth or of low degree, the unmarried woman who used a distaff was a spinster. And the word "distaff" itself came to mean woman's authority and domain and even to refer to women collectively and genealogically in the phrase, "the distaff side."

Man has a universal urge to express himself by means of color. Colors have long had significance in heraldry, in flags and banners, in robes and uniforms, apart from

Portion of the design from an old Peruvian fabric. This is an example of double fabric, in which two distinct cloths interlace with each other horizontally and vertically to form the pattern. The material is reversible, the design appearing in opposite colors on the back — a difficult weaving technique on a hand loom for a pattern as complex as this. It evidences an advanced stage of development of the art.





Portion of an old Coptic fabric, showing the principle of tapestry weaving. Here the vertical yarns of the picture were carried by shuttles interweaving individually only for a part of the distance across the warp. A varicolored pattern is thus formed, of any desired degree of complexity.

simple purposes of design. In early England, there were three ranks of the bardic order: The druid, or priest, wore white, the sign of purity and holiness. The bard, or poet, wore sky blue, the color of peace and tranquillity. The leech, or healer, wore the green of woods and fields, symbolizing the forces of nature. The postulants for the various orders wore not the solid colors of the initiate but rather garments striped in the colors appropriate to their chosen calling. The pure white uniform of the graduate nurse, as contrasted with the checks or stripes worn by the student nurse in our modern hospitals, is perhaps a survival of this ancient practice.

Color in a fabric becomes almost a living thing. From faintest tints to deepest tones, the softness and depth of velvet contribute to the richness of hue. Texture lends a feeling of majesty to the purple already regal in significance. Shining satin and cloth of gold may equally well become a blaze of glory. It is said that by the last quarter of the Nineteenth Century, M. Chevreul, director of dyeing for the Gobelin manufactory in Paris, developed for their extraordinary tapestries a color scale of some 14,420 different tones.

Of even greater fascination than the colorings of fabrics, however, is the variety of fabric in itself. Silk for many years was worth its weight in gold. Heliogabalus is supposed to have been the first emperor to wear all silken garments. Yet in time silks became so popular, and the manufacture and sale of them so profitable, that the code

of Roman laws, as revised in 533, gave a monopoly of silk manufacture to the court. Looms operated by women were set up there, and fabrics for the exclusive use of the court were woven for many years. Then developed the technique of wrapping yarns with narrow strips of gold leaf, yarn that later was to be woven into cloth or to be embroidered upon a fabric. These gold-leaf cloths were known as *tyssewys*, and the thin sheets of paper placed between the folds of fabric for its protection came to be known as "tissue papers."

During the medieval and modern periods, other ways of creating fabrics had their origin. Knitting might be noted as a first example. Actually the origin of knitting is veiled in obscurity. Whether it came into being in Scotland or Spain or Italy is still a question to be argued. In any case, Edward VI of England was presented with a pair of long Spanish stockings, and Queen Elizabeth, having discovered the superiority knitted stockings offered over the clumsily cut and fitted woven ones then in general use, would wear no other. At this time also, an English clergyman named William Lee is said to have invented a knitting machine operated by hand, which embodied the fundamental principles now found in modern power-driven knitting equipment.

Netted fabrics, in which the yarns are tied together, were made in Egypt thousands of years ago, and such fabrics appear today not only as laces but as fish, hair, tennis, and laundry nets. Braided fabrics, in which the yarns are plaited together, the same yarns forming ultimately the warp and filling of the structure, are also very old. Excavation of an ancient Celtic grave hill in Yorkshire revealed a body wrapped in a fabric made of braided strands of wool. Although the range of pattern and the width of a braided material are limited, compared with those of a knitted or woven fabric, braided products are still very much an article of commerce. They serve even today as the life line connecting the paratrooper with his parachute.

Lace, one of the most expensive of textiles when handmade, is produced with extremely simple instruments, as is true of most handmade fabrics. Needles, pins, bobbins, and a support (it may even be a pillow) are employed. Thus there is "needle-point" lace as well as "pillow" lace. The making of point lace is much the more ancient art of these and originated in Italy in very early times. Pillow lace, on the other hand, was probably first made in 1561 by Barbara, wife of Christopher Uttmann of Annaberg, Germany. Many varieties are well known and are named for the places of origin, as Brussels, Alençon, Lisle, and Honiton.

The nature of many fabrics with which we are familiar today is generally indicated by their very names, all of which have something of a world-wide flavor. The word "velvet" probably comes via the Italian *velluto* from the Latin *villus* for shaggy. The self-patterned silks, needing no coloring of the yarns in order to define their design, were called "diaper cloths," from the Greek *diaspros*—Latinized to *diasper*, meaning, originally, pure white; later, clearly separated. The "canvas" used in sails, in industrial applications such as webbing, belting, and filters, and as a foundation for the paintings by the masters, derived its name from the hemp of which it was originally fabricated, that is, *cannabis*. Quite probably the word "taffeta" has come to us from Persia (*tâftah*—a woven material) through Italy (Continued on page 152)

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Research on Sugar

A LONG-RANGE program of research on sugar, one of the least understood scientifically of the products of nature, will be undertaken at the Institute in co-operation with the newly established Sugar Research Foundation of New York. Plans for the project, which is expected to lead to new and important uses for both sugar and its numerous relatives of the carbohydrate family, were made public on December 8 in a joint announcement by President Compton and Joseph F. Abbott, President of the Sugar Research Foundation, which has made a grant of \$125,000 for a five-year program of research.

The foundation was created for the development of fundamental knowledge in carbohydrate chemistry, biochemistry, and nutrition. Membership is open to all producers and processors of sugar in this country, Puerto Rico, Hawaii, and Cuba.

Dr. Compton, in announcing the co-operative arrangement with the foundation, said: "The new program is another step in the Institute's long-established policy of co-operation with industry in fundamental research to improve industrial processes and develop new products. The project we are about to undertake is a pioneering plan of national significance in that it promises substantial benefits not for one organization but for an entire industry.

"The rewards of scientific research in co-operation with industry are by no means restricted to the development of new products, for the discovery of new knowledge in any branch of science invariably proves to be a contribution to advanced technical education in associated fields. Thus this sponsored research on sugar makes it possible for the Institute to continue and expand the program of fundamental investigations in the field of

carbohydrate chemistry which has been in progress for several years.

"We are particularly glad that Robert C. Hockett, Associate Professor of Organic Chemistry, who has been given leave of absence from our Faculty to become scientific director of the Sugar Research Foundation, will be in charge of this broad program.

"The sugar industry is to be commended for its public service and vision for making possible this objective research. I feel sure it will be rewarded by results of great scientific value to the public."

Commenting on the project, President Abbott of the research foundation, said: "It is anticipated that the chemical studies conducted under the arrangement with Technology will not only extend knowledge of the role of sugar and other carbohydrates in the human body but also will unfold wholly new industrial uses for sugar and its derivatives. It is our hope that the collaboration between the industry and this outstanding technical institution will prove to be of great benefit to science and the general public, as well as to the industry.

"An important objective of this broad research program will be the training of scientists in the field of carbohydrate chemistry to prepare them for service in the industry for further technical studies. Provision has also been made for fellowships for young graduate students who are candidates for advanced degrees to permit them to continue their work in this promising field. The number of carbohydrate chemists in this country is extremely limited.

"The operation of a laboratory at Technology is the first project in the announced program of the Sugar Research Foundation, which embraces comprehensive research and public educational projects to demonstrate the value of sugar and sugar products in the diet; the develop-

Joseph F. Abbott, President of the Sugar Research Foundation, and President Compton signing agreement for a long-range program of research on sugar by M.I.T. and the foundation. Robert C. Hockett, scientific director of the foundation and former Associate Professor of Organic Chemistry at Technology, is standing.





Navy V-12 students pass in review on Briggs Field.

ment of new uses for sugar and its by-products; and transmission to the public of pertinent and accurate information about sugar as a food.

"Sugar, whether from cane or beets, is one of the purest chemical substances known to man and is produced in enormous quantities at relatively low cost. Use of it as an inexpensive source material for chemical conversion to substances which can be utilized for other purposes than as food is an interesting scientific challenge which demands the most advanced investigation."

Recollections of Thomas A. Watson

BY MERTON L. EMERSON

From time to time, The Review has opportunity to present stories and sidelights of Technology history which have in the rush been little known to many Alumni. Among these, accounts of notable figures in the alumni group are of especial interest.

FAMOUS as the man who first heard the spoken word over the electric telephone — Bell's message, "Mr. Watson, come here, I want you!" — Thomas A. Watson, '94, had a distinguished career as an inventor, administrator, and philosopher. Both he and Mrs. Watson entered the same Class in the Institute some ten years after their marriage, many years after Watson had ended his association with the telephone business.

My own first remembrance of Thomas Watson is at about the time I was in grammar school in the town of Braintree, Mass. In the same class with me was Mr. Watson's son, Thomas, Jr., who died in early youth. Mr. Watson was chairman of the school board. I recall him as a kindly, diffident sort of man, who sometimes would read to us from Shakespeare or from other books that did not seem to have much to do with the world in which we were then living. Many years passed before I appreciated that Mr. Watson, besides being a pioneer in telephony, was, with Mrs. Watson, responsible for the town of Braintree's being among the first municipalities to have kindergartens, domestic science teaching for girls and

manual training for boys, and a municipal electric light plant. It was shortly before this time that Mr. Watson and his wife had attended the Institute and studied geology under Professor William O. Crosby, '76, with whom he had a lifelong friendship. Because of his continued interest in geology, he would often take small groups of boys and girls on trips about Braintree, into the Blue Hills, and particularly to the famous quarry which has long since disappeared but part of which, as seems quite appropriate, is the present site of Watson's pioneer shipbuilding plant, now owned by the Bethlehem Steel Company. Rare trilobites were found in this quarry, and I well remember hearing Mr. Watson say that we were standing there on one of the oldest parts of the earth's surface.

Thomas A. Watson was born in Salem, Mass., on January 18, 1854. His father operated a livery stable which had 100 horses and must have been a sizable business for that time. Watson's early schooling, as far as actual learning was concerned, apparently amounted to very little until, after attending high school for a year or more in Salem, he went to a business school in Boston for some six months. Here he learned the rudiments of book-keeping, banking, and commercial law, which proved practical tools for him in his future career. His eyes were poor, and so he turned to a trade, starting first as a carpenter; since that work was too heavy for him, he became an apprentice in the machine shop of Charles Williams in Boston.

This association with Charles Williams was the turning point in his career, for it was in this shop that Alexander Graham Bell was carrying out experiments on his inventions of "a harmonic telegraph." Watson in two years became a skilled journeyman, a practical inventor, and a maker of models and experimental apparatus. Bell recognized his ability and made him his assistant. It seems probable that Bell, who at that time was a young professor in Boston University, was the first highly educated man with whom Watson had ever come in contact. Bell's cultural effect on Watson's future life was very marked, as is shown in later years by his studies of art, music appreciation, voice, economics, geology, and human relations.

The development of the telephone is, of course, a story by itself. As the history of telephony shows, however, there is no question that Watson tremendously hastened application of it into early commercial use. Perhaps his real ability at that time can be measured by the fact that part of the consideration for his leaving Williams' shop and going with Bell in 1876 was that he was given a one-tenth interest in all of Bell's patents. His testimony in later years helped sustain Bell's pioneer patent in its long history of litigation.

During this busy period, while Watson was chief engineer, general manager, and the operating head of the National Bell Telephone Company, he took out more than 60 United States patents, covering telephone inventions that are in use today. In May, 1878, he hired as his assistant Theodore N. Vail, who later was for so many years president of the American Telephone and Telegraph Company. Watson resigned from the telephone company in 1881 at the age of 27 years.

After extensive travel in Europe, which greatly improved his health, he married Elizabeth S. Kimball of Cohasset, Mass., and they went to California to live. Shortly after, they returned to Braintree, where Watson, upon discovering that he could not revolutionize farming in rocky New England, established a small machine shop on his riverside farm. This shop was the beginning of the Fore River plant of the Bethlehem Steel Company.

Upon his retirement from the Fore River Ship and Engine Company after its reorganization in 1903, Watson did some commercial geological work with Professor Crosby, visiting Alaska several times. Later, with Mrs. Watson, he spent much time in Europe in the study of art and music appreciation, in the study of the speaking voice, and in travel. He wrote some plays in this period and toured England and Scotland with a Shakespearean company in which both he and one of his daughters took active parts and of which he was the financial angel.

The telephone was once more brought back into his life in 1914, when the American Telephone and Telegraph Company persuaded Watson to undertake lectures on the

story of the development of that business. With Alexander Graham Bell, he inaugurated the opening of the first transcontinental telephone line upon its completion on January 25, 1915. From that time until his death, he was active in lecturing and writing on the history of telephony. He died on December 13, 1934.

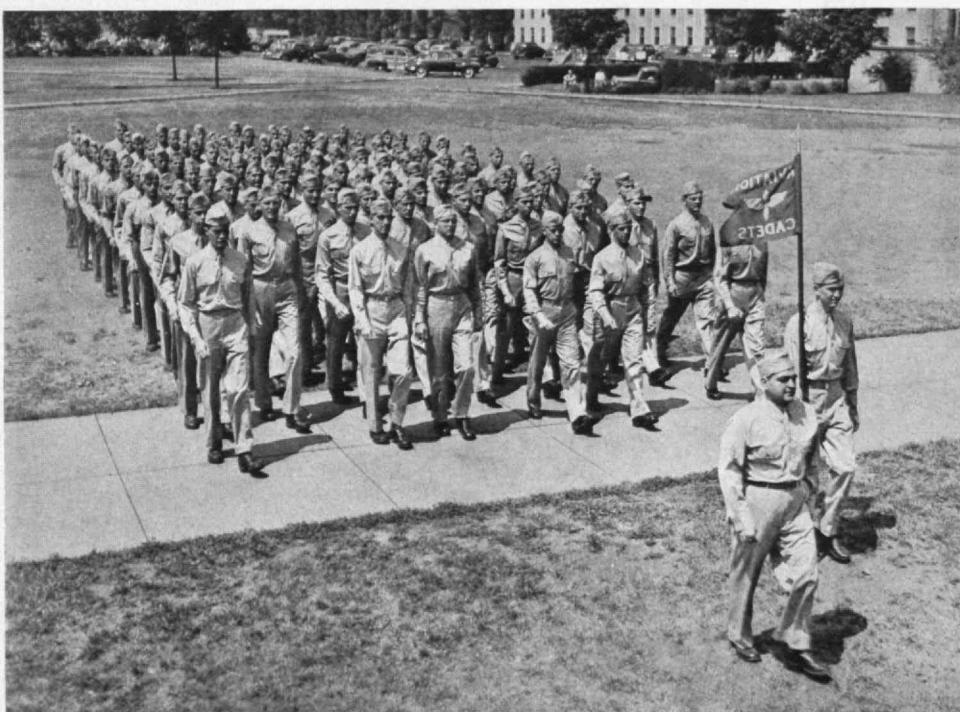
Thomas Watson was a fellow of the American Institute of Electrical Engineers. He was honored by Union College with the degree of master of arts, by Stevens Institute of Technology with the degree of doctor of engineering, and by the University of New Hampshire with the degree of doctor of science.

Technology men can remember with pride that this fellow Alumnus was the first person to hear words transmitted by electricity; that he constructed with his own hands the first electric speaking telephone and ran the first telephone wire; and that not only a pioneer in the modern field of research, he was also a man of unusually wide cultural interests.

Reciprocity

ARRANGEMENTS have been completed for an exchange of graduate students and members of the staff of the Institute and the Imperial College of Science and Technology of London. The plan will go into effect as soon as possible. This pleasant alliance between the two scientific and engineering institutions was brought about as a result of conversations between Dr. Compton and R. V. Southwell, Rector of the Imperial College of Science and Technology. Plans for the exchange have been approved by the executive committees of the Imperial College and the Institute.

The plan offers students and staff of both institutions unusual opportunities for studies of educational methods and industrial technology of the two countries. In announcing the reciprocal arrangement in England, Dr. Southwell said: "This is an active step to implement the purpose of our charter, which is to give the highest specialized instruction and to provide the fullest equipment



Aviation cadets cross the walk to Walker in the course of evolutions characteristic of the times at the Institute.

for the most advanced training and research in various branches of science, especially in its application to industry."

Dr. Compton welcomes the plan as a manifestation of the cordial co-operation between British and American scientists, whose personal and professional friendships have been intensified by a constant exchange of information on technical developments in war research.

Filial Roster

SONS of 37 Alumni of the Institute are following in the paternal footsteps through enrollment in the present freshman class. Alteration in the general enrollment situation of American colleges and universities is indicated by the fact that the list this year compares with one of 47 sons registered as freshmen last year. The list for the present class follows:

Son	Father
Richard M. Adler	Julian E. Adler, '13
Gale Allen	Howard B. Allen, '18
John F. Allen	Andrew F. Allen, '12
Joseph R. Altieri	V. Joseph Altieri, '23
George B. Bailey	George B. Bailey, '22
John E. Bent	Roderic L. Bent, '19
Peter Bolan	Robert S. Bolan, '19
Edward H. Bowman	Harry L. Bowman, '14
Harold S. Dodge	Harold F. Dodge, '16
William R. Frazer, Jr.	William R. Frazer, '22
Malcolm Gordon	Barnett D. Gordon, '16
Harland A. Gray, Jr.	Harland A. Gray, '20
Alexander E. Halberstadt, Jr.	Alexander E. Halberstadt, '21
Randall J. Hogan, Jr.	Randall J. Hogan, '22
Harold L. Humes	Harold L. Humes, '22
Francis N. Kurriess	Francis J. Kurriess, '23
Burton A. LeVine	Harry C. LeVine, '18
Colin McCready	Harold McCready, '09
James G. Moir, Jr.	James G. Moir, '20
Henry M. Morgan	James F. Morgan, Jr., '14
Joseph S. Newell, Jr.	Joseph S. Newell, '19
Robert W. Noce	Daniel Noce, '21
John E. Pinkney	William Pinkney, Jr., '19
William B. Ramsey	J. Raymond Ramsey, '17
Frank P. Smith, 2d	Oliver V. P. Smith, '21 (deceased)
Robert R. Smyth	Ralston B. Smyth, '19
Frank R. Stevens	Raymond Stevens, '17
Robert E. Tisdale	Ellis S. Tisdale, '15
George K. Turner	Rodolphus K. Turner, '23
John M. D. Walch	Donald E. Walch, '22
David L. Walton	Charles O. Walton, '13
Gerard Walworth	Walter F. Walworth, '19
Thomas E. Weil	Edgar H. Weil, '13
Frank T. Westcott	Frank T. Westcott, '22
Arnold B. Whitaker	William G. H. Whitaker, Jr., '04
John E. Whitman	Percy G. Whitman, '13
Arthur J. Wilson, Jr.	Arthur J. Wilson, '23

James Vaught Dotson, 1914-1943

JAMES V. DOTSON, research associate in the Department of Meteorology, died in an airplane accident in Vermont on November 26. The flight was one of the first of a series planned to test equipment developed by a research project on the de-icing of aircraft, which he was directing at the Institute under the Division of Industrial Co-operation and in collaboration with the United States Army.

Dotson was born in Nashville, Tenn., on January 29, 1914. After taking his bachelor's degree in electrical engineering at the University of Tennessee, he came to Technology in 1937 as a graduate student in the Department of Physics. He was a research assistant in the Department of Electrical Engineering from 1937 to 1939, studying the physical and chemical properties of mineral insulating oils. Transferring his activities to the Department of Meteorology in 1941 as a research associate, he became identified with the program of research concerned with ice formation on aircraft. Through his resourcefulness and imagination he was instrumental in enlarging greatly the size and scope of this research. Dotson showed much promise both as an experimental and as a theoretical scientist, and made effective contributions on both of these counts to the problems on which he worked.

He is survived by his wife, Joan Grant Dotson; his parents; and a sister.

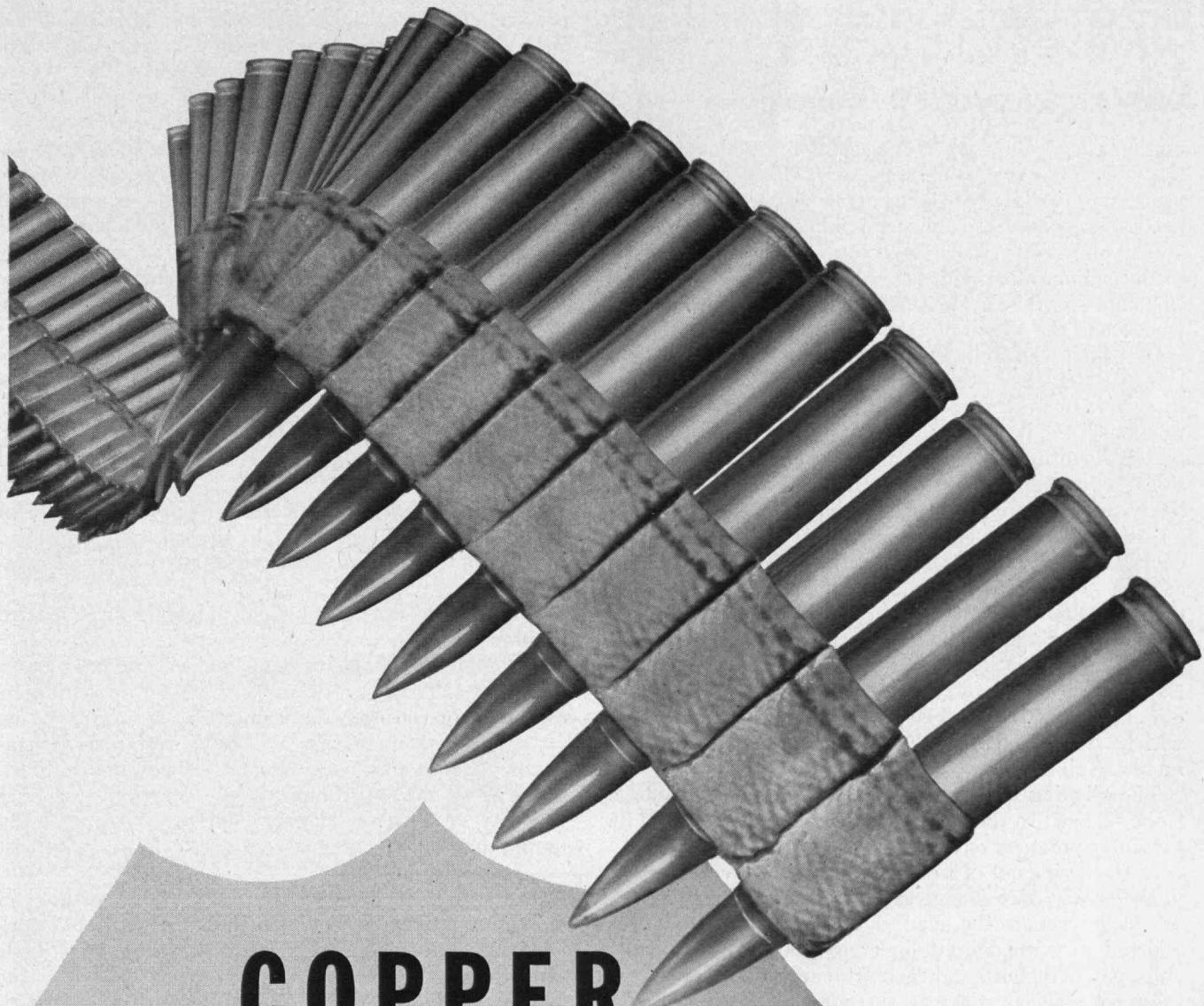
With the Council

CHANGE of the date of Alumni Day 1944 to Saturday, February 26, was emphasized at the 235th meeting of the Alumni Council, which was held at the Smith House in Cambridge on the last Monday in November. The shift from the date earlier announced was necessitated by a change in the date of graduation for the Class of 2-44. Plans for the festivities of February 26, the Council was told, are progressing properly. Committees named by Herbert R. Stewart, '24, chairman, Alumni Day 1944, were elected by the Council as follows: *publicity*, Ralph T. Jope, '28, chairman, Henry B. Kane, '24, James Donovan, '28, John J. Rowlands and Frederick G. Fassett, Jr., staff; *ladies' events*, Mrs. Leicester F. Hamilton, chairman; *Class Day*, John D. Mitsch, '20, chairman, Eugene Mirabelli, '19, Paul M. Chalmers, staff; *registration*, Donald P. Severance, '38, chairman, Joseph C. MacKinnon, '13, Robert M. Kimball, '33, Wolcott A. Hokanson, staff; *ways and means*, Horace S. Ford, staff, chairman, Carl M. F. Peterson, '29, Delbert L. Rhind, staff; *dinner*, Josiah D. Crosby, '21, chairman, Arthur L. Shaw, '09, Larcom Randall, '21, James A. Pennypacker, '23, Robert C. Casselman, '39.

Reporting on the Alumni Fund, Director Kane stated that the leads over 1942 reported last month were continuing. As of November 29, a total of 8,063 contributors had given \$96,880.26, the average being above \$12.

Francis J. Chesterman, '05, President of the Alumni Association, then introduced as speaker of the evening George R. Harrison, Dean of Science, whose subject was announced as "A Hedgehopping Tour Around M.I.T. with the Dean of Science and Glimpses of War Work through His Eyes."

Dean Harrison's talk included many anecdotes ranging from the difficulties of the conversion of the Institute's heating system to burn coal instead of oil, to enlargement of staff and facilities of the Medical Department in order to care for the increased demands imposed by the greater number of people now busy at the Institute. From these, and from stories of the operation of the Institute cyclotron on an accelerated schedule, Dean Harrison went on to comment on the war effort in general. Pointing out the importance of science in developing weapons and otherwise influencing the conduct of warfare from the beginning of history, he commented (*Concluded on page 170*)



COPPER IS THE SHIELD OF DEMOCRACY

The spectacular rise in the American Standard of living during our lifetime has been keyed to copper. On the day of Pearl Harbor, 20 billion pounds of it were busy doing the nation's work. Through it, Americans enjoyed protection and comfort impossible elsewhere. Today, of course, all copper is used for the war effort. And not a plane flies, not a ship sails, not a bullet is fired without copper, brass or other copper-base alloys playing an indispensable part. But tomorrow, when peace is won, Revere copper will function again in the vital parts of automobiles, home appliances, houses, industrial equipment and a thousand commercial products. And in addition, Revere metals will be ready to help turn war-born inventions and ideas to become the working realities that will bring you more freedom, more security, more ample living. Revere will welcome inquiries about copper and its versatile alloys.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
Executive Offices: 230 Park Ave., New York 17, N. Y.

AVIATION AFTER THE WAR

(Continued from page 138)

radically new, something revolutionary, comes along to raise the ceiling and to let the curve break upward again. Little is in sight which will account for such change in the next few years, war or postwar. Thousands of improvements in detail are being made which are constantly bettering our aircraft designs, making for increased reliability and utility. Each brings us nearer, inch by inch, to the ceiling. But the lines of physical limitation appear to be holding. The break-through that would unleash the wonders of the World of Tomorrow is not yet in sight.

Of course the military people have up their sleeves things which they are not talking about. That is to be expected. In wartime especially, no one shows his secret weapons. But it is a safe bet that, given adequate research facilities and first-rate research talent for both sides (as is the situation in the present war), neither is likely to pull many unsuspected rabbits out of hats.

Flying wings have been mentioned. The usual conception is an airplane unencumbered by fuselage, tail surfaces, or protruding engines, with pilots, passengers, cargo, and power plants housed wholly within the boundaries of the wing. Such machines should be more efficient than the conventional types. Their proponents claim that with a considerable percentage of the normal drag out of the way, they will go faster with less power, farther with less fuel. Such planes have been built experimentally, more are abuilding.

The all-wing type has limitations: For its advantage to be realized to the full, it must be made too big to be presently practical or economically justifiable.

In the laying out of a conventional airplane, the *weight* of the combined passengers, pilots, fuel, and cargo more or less determines the over-all size of the aircraft. For a selected gross weight, a designer arrives at a wing of suitable span and chord and then attaches to it a housing of the most efficient shape to surround his inanimate and human cargo. In the laying out of a flying wing, however, *space* is a determining factor. The designer must lay out a cabin with suitable headroom, length, and breadth, and then provide a wing big enough to enclose it completely. Over-all dimensions immediately become Gargantuan.

This is not the place to go through the calculation, but studies have indicated that the all-wing type of airplane for normal passenger use begins to be practical at a gross weight of about 350,000 pounds. This is a long jump ahead. Today's passenger airplanes range from 25,000 to 80,000 pounds gross. Most air-line executives, in planning for the potential traffic of the next five to ten years, believe that the optimum airplane for their purposes will weigh in the neighborhood of 100,000 pounds. And even the most optimistic planners for transocean services limit their thinking to airplanes of about half the size of the minimum flying-wing type.

For military use, the foregoing argument does not hold. It is possible to conceive of a fighter pilot lying prone inside a very small wing, or of bombers whose highly concentrated dead loads readily lend themselves to stowage within a wing of practical dimension.

There is little question that the all-wing type would show improvement over the best of the current designs, provided its undesirable characteristics can be overcome. Its stability in turbulent air is debatable, and there are

problems of control and of power plant installation yet to be solved. Nevertheless, it would only be another step, albeit a substantial one, toward the present ceiling. It does not appear to be the revolutionary idea that will carry us upward into a completely new stage of development.

The successful use of the towed glider in military operations has also put fantastic ideas into people's heads. The aerial "train" sweeping across the skies, casting off cargo and passenger gliders over cities, swooping low to snatch freshly loaded tows from the ground, is technically possible. The late Richard C. du Pont and his associates have carried this development to the point of practical use. They have demonstrated that it can be done. After the war, however, the glider train will be judged by only one criterion — cost per ton-mile operated. It is strange how many people, including engineers and businessmen, seem to think that they can get something for nothing. The addition of two or three gliders behind a powered airplane materially ups the drag, reduces speed, and increases to a considerable degree the power required for flight. While an increased weight of goods may be carried by the combination, indications point to a marked increase in ton-mile cost through the use of gliders, as compared with the cost for an equal weight of cargo carried in powered airplanes at higher speeds.

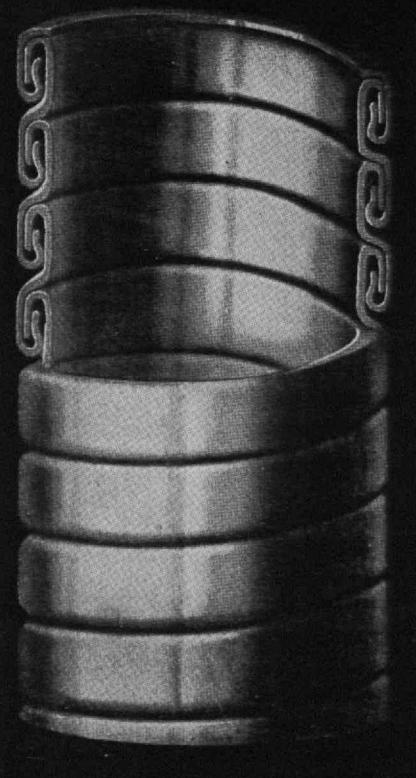
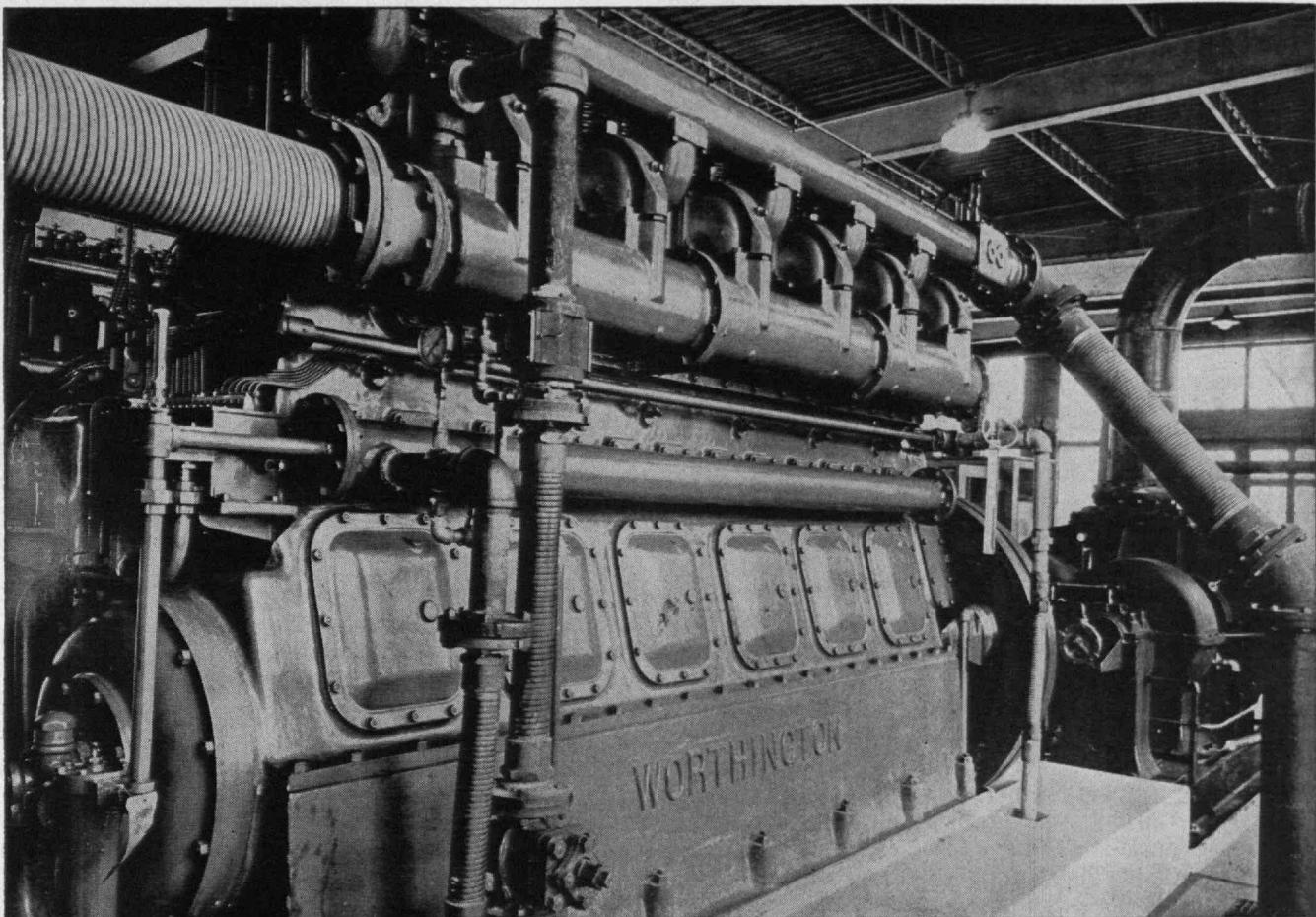
Although the cargo-carrying glider train may have military justification, it is unlikely to play a very important part in the immediate postwar air-transportation picture unless something new turns up in the aerodynamics of gliders or in the economics of powered aircraft. Gliders hold out little promise of affecting present ceilings one way or another. If they ever prove economically useful, they will do so in the period *after* the next upthrust in efficiencies, not before.

The helicopter is frequently cited as the solution of most of aviation's problems. Although remarkable work has been done by a few pioneering experimenters, little was actually accomplished until recently, when the military took some interest. The Army has an experimental section at Wright Field which is exploring helicopter possibilities. The Navy has shown interest in the type for antisubmarine and convoy duty. A veritable flood of publicity has been released by each activity. Even so, rotary-wing projects still carry low priorities. Contrary to popular belief, the actual amount of helicopter test flying that has been accomplished in this country is shockingly small. Probably it adds up to less than a thousand hours. The number of such machines that have been flown could be counted on one's fingers.

Latterly, the pace is being accelerated. Funds have just been provided for specialized equipment needed for research at government laboratories. Meanwhile, dozens of concerns have capitalized on premature publicity while a few interested manufacturers and at least one university have done some real work. The total volume is microscopic, however, as compared with the labors that must be performed before a helicopter for Everyman is on the market. Here again is a good example of the ease with which wishful thinking in aviation can outrun actual accomplishment.

When it does come, the break will more likely be touched off by something outside of aeronautical engineering proper, possibly from the field of chemistry or of heat engineering. We are still a long way from utilizing all the

(Concluded on page 152)



PENFLEX Metallic Hose

**.... Armored for Safety
.... Flexible for Service**

Uninterrupted Service and Safety are important factors in generating power for War Production. PENFLEX Metallic Hose with 4-wall interlocking joint construction and $\frac{3}{8}$ " "come and go" per lineal foot of length is designed for long life, trouble-free service on intake and exhaust lines, oil, water and other connections. It resists thermal and mechanical strains and fatigue... it absorbs vibration and provides safe, economical service.

PENFLEX WELD corrugated, jointless Tubing gives leakproof service on fuel oil feed, circulating water, and starting air lines.

Full data in practical diagrammatic form in Bulletin 71.

In sizes 1" to 18" I. D.



PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.

7211 Powers Lane, Philadelphia, Pa.

ESTABLISHED 1902

AVIATION AFTER THE WAR

(Concluded from page 150)

energy locked in fuels. This condition, of course, is true for practically all prime movers or power generators. In the transformation of the chemical energy of fuels into mechanical energy at the end of a shaft or into propulsive thrust behind an airplane or a ship, a very high percentage of waste occurs. Intensified study is now being made of means for utilizing more of the heat developed in aircraft engines. Ways of improving propulsive efficiency by jet reactions are being investigated. The subject is of great military interest today and, as such, is on a very confidential basis. It is a generally known fact, however, that all of the first-rate aeronautical powers are experimenting with new ways of propelling aircraft.

Everyone interested in flying over extremely long ranges has been struggling for years to reduce fuel consumption in cruising to get the maximum mileage from a given weight of gasoline. It has been considered worth while to go to almost any length to improve specific fuel consumption by a few per cent. If, however, some new type of engine or some new combination of engine propeller plus a thrust augmenter should make possible the recovery of a considerable portion of the heat energy which is now wasted, present operating ceilings would again be raised. Or, looking farther into the future, some form of atom smashing might obsolete all present power plants and raise limits to a degree beyond our imagining.

Such changes can come in only one way — by research and more research. The probabilities of lifting the ceiling by inspiration or invention are remote. No half-starved, long-haired genius is likely to stumble from his attic crying, "Eureka!" — with the solution in his hand. But the mathematician and the slide rule artists who are slowly and painfully computing and tabulating the characteristics of slightly better airfoils; the young engineers who are watching the behavior of models in wind tunnels in order to forecast and to prevent erratic behavior of the eventual plane in the air; the lads who are peering into incandescent combustion chambers or who are bending over test tubes to gain another tenth of one per cent in fuel efficiency — these are the people who are laying the solid foundation for aviation of the future.

In wartime, for obvious reasons, all laboratories are concentrating almost entirely on investigations that directly and immediately affect the war effort. All are working under directives written by the Army and Navy. Other things must wait, and into this category fall many of the problems that must be explored at length before our dreamworld aircraft can be designed.

It would be a pity if the tempo of aeronautical research should be allowed to lag in the immediate postwar years. Then, if ever, we shall need an all-out effort to improve the efficiency of aircraft. The push for quantity will be over, the drive for quality must be redoubled. Instead of striving for maximum military performance regardless of cost, we must shift the emphasis to problems of maximum efficiency at minimum operating cost, to improvements of control, and to greater safety for the citizen who flies his own plane.

There is no quick and easy road. Constant research in a dozen different fields must be relentlessly pursued and the results painstakingly analyzed to produce solutions for aviation's problems, now and hereafter.

FABRICS OF OUR FATHERS

(Continued from page 144)

(taffettà). "Flannel," on the other hand, may have evolved from the Welsh for wool, namely, *gulanen*. From the Latin *pilus*, meaning hair, through the French *pluche*, we get our "plush." "Nainsook" comes from the Hindu word *nainsukh*, meaning eye pleasure.

Other fabrics have names derived from their places of origin. "Saracen" comes from Saracenicum — silk woven by the Saracens. "Damask" was Damascus silk. "Muslin" came from the Mesopotamian city of Mosul. The first Mohammedan capital of Egypt, Fustat, lends its name to "fustian." "Wilton," "Axminster," and "Brussels" are names of carpets and of the towns noted for early manufacture of them. Calicut, India, gives us "calico," representing a tremendous range of printed cotton cloth, proceeding slowly at first from beneath crude hand blocks and later pouring in torrent from the whirling copper cylinders of the printing machine. A tapestry hanging and a curtain in general came to be known as an "arras," from the city of the same name. "Cambric" and "chambray" came from Cambrai.

Legend runs that wool combing was invented by St. Blasius, bishop of Sebaste, in the Fourth Century. Dyer in his book, *The Fleece*, described it as follows:

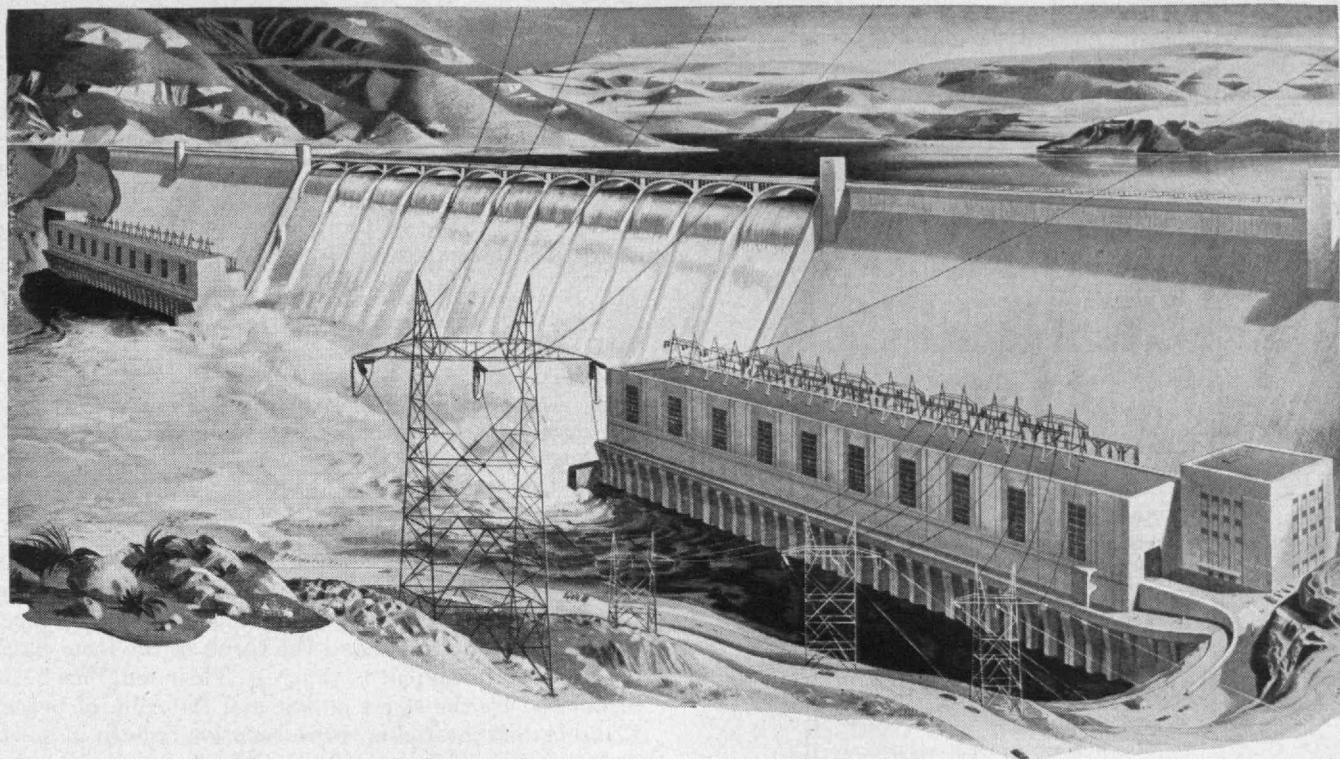
Thus in elder time
The rev'rend Blasius wove, his leisure hours,
And slumbers broken oft: till fill'd at length
With inspiration, after various thought,
And Trials manifold, his well-known voice
Gathered the poor, and o'er Vulcanian stoves,
With tepid lees of oil and spiky comb,
Showed how the fleece might stretch to greater
Length, and cast a glossier whiteness. Wheeles went round,
Matrons and maids with songs relieved their toils:
And every loom received the softer yarn.
What poor, what widow, Blasius, did not bless
Thy teaching hand — thy bosom like the morn
Opening its wealth? What nation did not seek
Of thy new-modelled wool the curious webs?

Gaul, at about the time of Caesar, was noted for a fabric which the Romans called *sagum*. Later, throughout Picardy, it became *sayon* and finally *saye*. Even after the end of the Roman Empire, *saye* lived on — not only lived on but was taken by the Franks and carried to the West to Merrie England, where it clothed no less a personage than Robin Hood. Soon the word became "sarge" and at last "serge" as we know it now.

Another garment much beloved by our ancestors — a hooded, waterproofed cape — was known as a *bura*. Eventually the hood became known as a *birrus* and thence evolved into our popular "beret." The material itself was used as a cover for tables and desks. An account book of Charles VI of France in the Fourteenth Century listed: "Two dozen parchments, an ink-horn, a penknife in a silk sheath, a bureau to cover the table." How far that word has since traveled, from a name for the piece of furniture or its cover to bureaucracy itself!

Beyond the importance of the fabrics themselves, embroidery played its role. Embroidered coats of arms were popular in Colonial times. The direction of the stitches followed the laws of heraldry: vertical for gules, diagonal (right to left) for purpure, and horizontal for azure.

(Concluded on page 154)

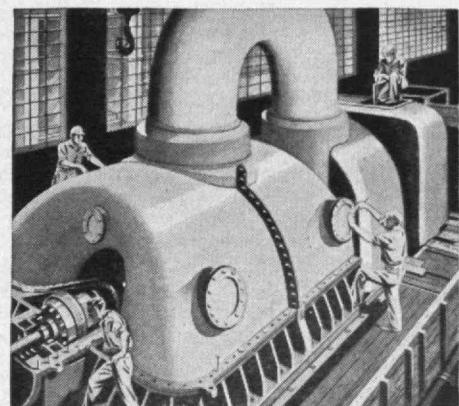


Westinghouse generators make power for a nation at war...

From the world's largest water-wheel generators at Grand Coulee Dam—from Westinghouse steam-driven generators in power plants throughout the nation—flow billions of kilowatts of electric power to turn the wheels of America's war industry.

Westinghouse combines the power of a thousand human skills...

A workman at a lathe, a girl on an assembly line, an engineer on the test floor—theirs, and the countless other skills of 103,000 Westinghouse employees, are welded into a single great production force. Their vast experience and knowledge help to produce the vitally needed power-generating equipment to drive America's mighty war machine.



Westinghouse contributes the power of immense new knowledge...

When the incredible weapons born of wartime research are reforged for peacetime service, the daily miracles that electricity will perform are certain to create new and finer standards of living . . . while the cost of electricity continues to decrease as our nation's power-generating capacity continues to increase. Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. Plants in 25 cities—offices everywhere.



WANTED

for the

PHILCO

ENGINEERING

STAFF

● **RADIO—ELECTRONICS—ELECTRICAL ENGINEERS**

Men with degrees in electrical engineering or comparable experience in radio and television.

● **MECHANICAL ENGINEERS**

Men with college degrees or comparable experience in the engineering aspects of electrical appliances, and in designing small machinery.

● **DESIGN ENGINEERS — DRAFTSMEN**

Men with experience in mechanical designing, especially of small metal parts and of the automatic machinery to mass-produce them.

● **PRODUCTION ENGINEERS**

Including electrical and mechanical engineers familiar with any phase of radio, radio-phonograph and television production.

● **PHYSICISTS**

Must have science degree in physics. Some practical experience in radio is desirable.

FOR these and other key positions—senior and junior engineers for research, project and design work, physicists and mathematicians—we are looking for men who are thinking about the future. Right now there is plenty of urgently needed war work to do. But some day peace will return—and Philco is planning to be ready for it with advanced Radio, Television, Refrigeration and Air-Conditioning products. This may be your opportunity to get ready for it too.

WRITE US TODAY

Qualified men not now engaged in work requiring their full talents, are invited to write us in detail as to their experience, education, family and draft status, and salary. Letters will be treated in strict confidence.

Employment subject to local W.M.C. rules.

WRITE TO MR. GEORGE DALE

PHILCO
CORPORATION
Philadelphia 34, Penna.

FABRICS OF OUR FATHERS

(Concluded from page 152)

The sampler combined the teaching of both sewing and letters. The custom was carried to an extreme in the embroidering of mottoes and other sentiments on the edges of gowns and petticoats. Writing in 1640, John Taylor, in his "The Praise of the Needle," listed many of the types of stitch employed:

For *Tent-worke*, *Raisd-worke*, *Laid-worke*, *Frost-worke*, *Net-worke*,

Most curious *Purles*, or rare *Italian Cutworke*,

Fine *Ferne-stitch*, *Finny-stitch*, *New-stitch*, and *Chain-stitch*,
Braue Bred-stitch, *Fisher-stitch*, *Irish-stitch*, and *Queen-stitch*,

The *Spanish-stitch*, *Rosemary-stitch*, and *Mouse-stitch*,

The smarting *Whip-stitch*, *Back-stitch*, & the *Crosse-stitch*,

All these are good, and these we must allow,

And these are everywhere in practise now.

Paul Rodier, in *The Romance of French Weaving*, strikes a keynote with his phrase, ". . . where a loom is waiting the night of savagery is over." Through art and science, the hum of the spindle and the throb of the loom have played accompaniment to progress. Their song has been modulated by the stress of war and the calm of peace. Folksong and martial air have been interwoven in gown and tapestry. Homespuns and jeans have marked the forward march of labor no less than have broadcloths and worsteds. It is perhaps symbolic that our fathers' religion and our own have seen in robe and hanging the interlacing of warp and weft to form a cross.

Weave, brothers, weave! — Weave, and bid
The colours of sunset glow!

Let grace in each gliding thread be hid!

Let beauty about ye blow!

Let your skein be long, and your silk be fine,
And your hands both firm and sure,
And time nor chance shall your work untwine,
But all, — like a truth, — endure!

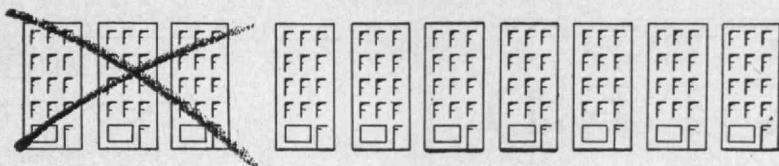
— BARRY CORNWALL

MEET TARSIUS

(Concluded from page 140)

Among the primates, Tarsius is the only form which has developed specialized muscular pads on toes and fingers, by means of which it is capable of a suctional action which enables it to cling to many surfaces by pressure and suction rather than by grasping and holding. It cannot, however, walk like a fly on a vertical plane or upside down on the ceiling. On the ground or among the trees where it chiefly lives, it jumps like a frog, making leaps of about six feet in length and, in doing so, jumping about four feet into the air. This is pretty good jumping when one remembers the tiny size of the animal.

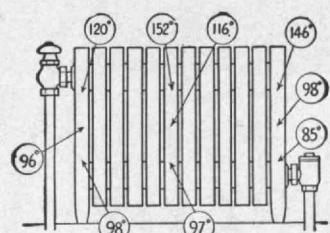
As among all primates, tarsiers are usually born singly, and from all reports the tarsier appears to be monogamous; couples remain together even when herded with others, and the male allows the female to take food away from him without protest. With regard to food, the natives in most of the regions in which tarsiers occur believe that these little creatures consume charcoal. Whether or not they do, future investigation may show. Meanwhile we have a lot to learn about Tarsius, our much neglected distant relative.



Yes . . . 7 out of 10 buildings
 can get more heat
 with less fuel

With fuel rationing, it is more important than ever that buildingowners thoroughly investigate their heating systems to make sure they are not wasting valuable fuel.

Webster Engineers have found through thousands of surveys that seven out of ten large buildings in America (many of them less than ten years old) can get more heat per unit of fuel consumed.



Actual proof of low radiator temperatures! Here are actual temperatures at nine points and showing average radiator temperature of 112° F. . . . due to scientifically controlled turbulence.

Before the development of the Webster Moderator System, steam was either "off" or "on" except for the control provided

by the radiator supply valve. There was no better way to control quantity of steam delivery to radiators.

The Webster Moderator System prevents the discomfort of "scorching hot" radiators by making possible low radiator temperatures . . . Eliminates annoying and fuel-consuming surges of heat—or "cold spots"—by supplying heat continuously to all radiators through orifices and central controls. There is no waste of valuable fuel through overheating.

If you are interested in getting more heat with less fuel, write for "Performance Facts." This free booklet gives case studies of 268 modern steam heating installations and how they are effecting great savings in fuel.

WARREN WEBSTER & CO., Camden, N. J.
 Pioneers of Vacuum System of Steam Heating :: Est. 1888
 Representatives in principal U. S. Cities :: Darling Bros., Ltd., Montreal



Making Boosters for
 U.S. Army Ordnance

Webster
 Steam Heating

WANTED

ADVERTISING DIRECTOR

HIGH-GRADE advertising director, technical graduate, familiar with mechanical equipment used in power plants, refineries, ships. Agency experience helpful. Must be capable and responsible for all advertising details. Location Chicago. Long established and sound firm. Outline experience and education. Live wire, creative, ambitious young engineer, around 35, desired.



Reply to Box C

THE TECHNOLOGY REVIEW CAMBRIDGE³⁹
MASS.

CONVERSION AND THE CONFEDERACY

(Continued from page 142)

Europe to study ordnance and arsenals there. On his return, he was sent to the Watervliet Arsenal in New York State and then went with General Winfield Scott to the Mexican War, after which he returned to ordnance work. While on duty at Mobile, Gorgas married an Alabama girl. His conservative bent inclined him against the antislavery movements of the day. When the Confederacy was organized, he went with it and was at once made chief of ordnance of the secession army.

The South's seizures of Union arms proved much more impressive statistically than they were for combat use. About 15,000 rifles had been taken, but many of these were antiquated. Of smoothbores, 130,000 fell into Confederate hands, but these were useful only at short range. In addition, the South secured 90,000 flintlocks, almost of the vintage of the War of Independence. No cavalry arms were taken. The 429 captured cannon were principally old guns in the coast defense fortifications. These were short range and of old design. The few field guns went back to the War of 1812. But there was one stroke of luck. Although there was not a manufacturing arsenal in the Southern States, Virginia seized the arsenal and armory at Harper's Ferry. The machinery from there was soon removed and sent south.

The Confederate ordnance chief had two main problems: guns and powder. He could look into the future and see that the matériel would be needed from northern

(Continued on page 158)

POOR & COMPANY

RAILWAY EQUIPMENT

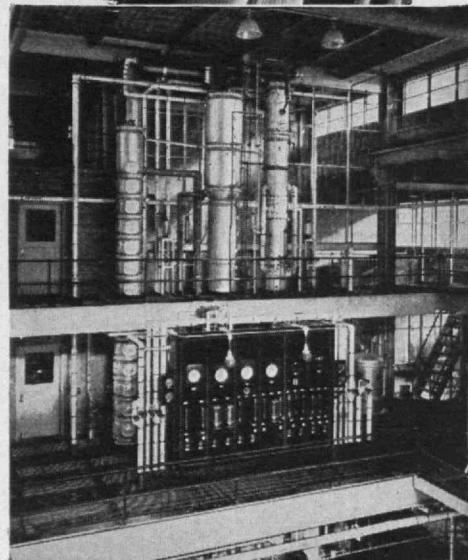
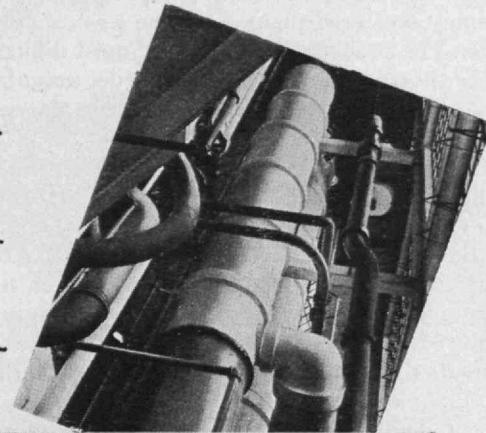
CHICAGO, ILLINOIS

COMPLETE ORGANIZATION SERVICE

in the highly specialized fields of

*DISTILLATION
EVAPORATION
EXTRACTION*

PROCESSES and EQUIPMENT



VULCAN

CINCINNATI

The Vulcan organization devoted exclusively to the highly specialized fields of Distillation, Evaporation and Extraction, serves the Process Industries with sound experience and assumes undivided responsibility for the development and design of projects involving these operations.

RESEARCH... BASIC ECONOMIC PLANNING
PILOT PLANT OPERATION
PLANT and EQUIPMENT DESIGN
FABRICATION... INSTALLATION
INITIAL OPERATION

THE **VULCAN** COPPER & SUPPLY CO., CINCINNATI, OHIO

CONVERSION AND THE CONFEDERACY

(Continued from page 156)

Virginia to Texas — and that the indifference of the Confederate railway network would almost compel manufacture in many scattered plants. And he was exactly right about this. The problem which proved most difficult was neither the shortage of saltpeter for powder manufacture, nor of lead, nor of arsenal machinery; it was the continuous breakdown of rail transport.

General Gorgas distributed his arsenals over the South, establishing them at Charleston, S. C.; at Augusta, Atlanta, Columbus, and Macon in Georgia; at Selma, Ala.; at Baton Rouge, La.; and at Little Rock, Ark. The Harpers Ferry machinery was divided between a Richmond armory, where rifle muskets were converted or manufactured, and Fayetteville, N. C., where a new armory made rifles. He set up a cannon foundry in Macon and the chief Confederate powder mill in Augusta.

The Confederate authorities were not too hampered by absolute lack of essential military materials. Lead mines opened near Wytheville, Va., supplied most of the lead for bullets. The Ducktown and Copper Hill mines supplied copper needs until Sherman got to the south of them. Virginia and Alabama iron ores were ample for the raw pig iron needed for ordnance purposes.

More strenuous efforts had to be made to secure saltpeter. When Gorgas established the powder factory at Augusta, he put a skilled chemist and ordnance technician, Colonel George Washington Rains, in charge of it,

and the latter soon began turning heaven and earth to get saltpeter. He decided that a principal source would be the floors of the limestone caves throughout the South, where large deposits of niter would likely be found. He soon published a pamphlet, which was widely circulated, entitled *Notes on Making Saltpetre from the Earth of Caves*. The shortage seemed so critical in 1862 that Gorgas organized a separate military niter and mining bureau under Colonel Isaac M. St. John, who was successful.

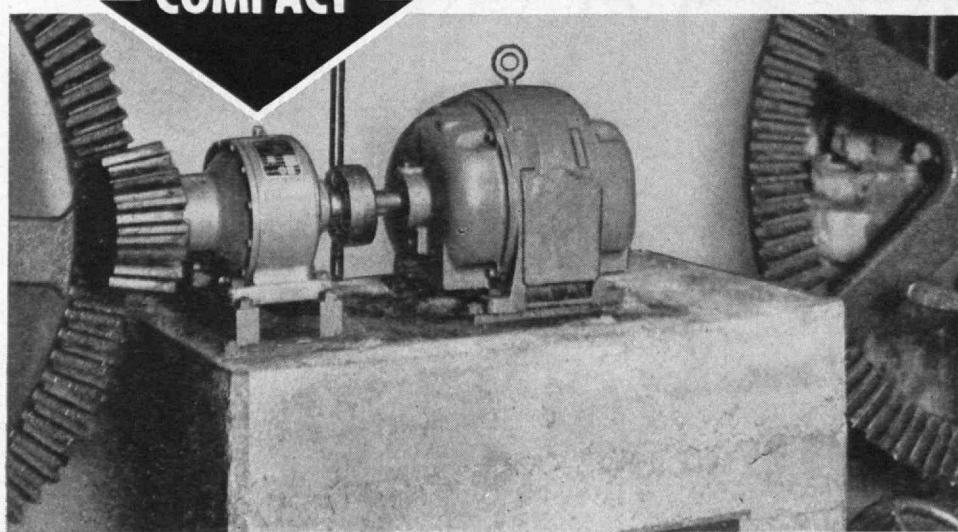
Rains's powder production record was quite extraordinary. A North Carolinian by birth, he served in the Mexican War. Although a chemist by profession, he became the president of some successful ironworks in New York. He managed the production as well as the technical problems of the powder factory with high success. In this, he followed the processes in use in the Waltham Abbey Government Gunpowder Works in England, but he made many improvements on them.

The Augusta mill did not close its operation until April 18, 1865. During the three years of its life, it made 2,750,000 pounds of gunpowder for the Confederate military services. At all times there was an ample supply of excellent powder for the Southern soldiers. Often it was not on hand at the point of need, but the fault was transport, not production.

A word more about Gorgas: After the war, he turned to the field of education. In 1869 he went to the University of the South at Sewanee, Tenn., taught there and served as vice-chancellor. In 1878 he became president of the University of Alabama, which office he resigned a year later because of ill-health. He became librarian of the uni-

(Continued on page 160)

IT'S
SO
COMPACT



WHS PATENTED DIFFERENTIAL SPEED REDUCER

... and economical, too!

Unrivaled for space-saving ...twice as compact as speed reducers of like ratio and capacity. Unequaled for design simplicity...whether 3 to 1 or 30,000 to 1 reduction, the small number of parts remains the same. Quiet-running helical gears and equalized load distribution contribute to outstanding efficiency and economy.

Fully described and illustrated in our new Catalog No. 144

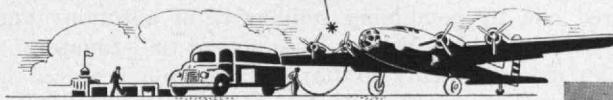
CUTTER P. DAVIS, M. I. T. '19, President



WINFIELD H. SMITH, Inc.

55 MAY STREET... SPRINGVILLE .. ERIE COUNTY .. NEW YORK

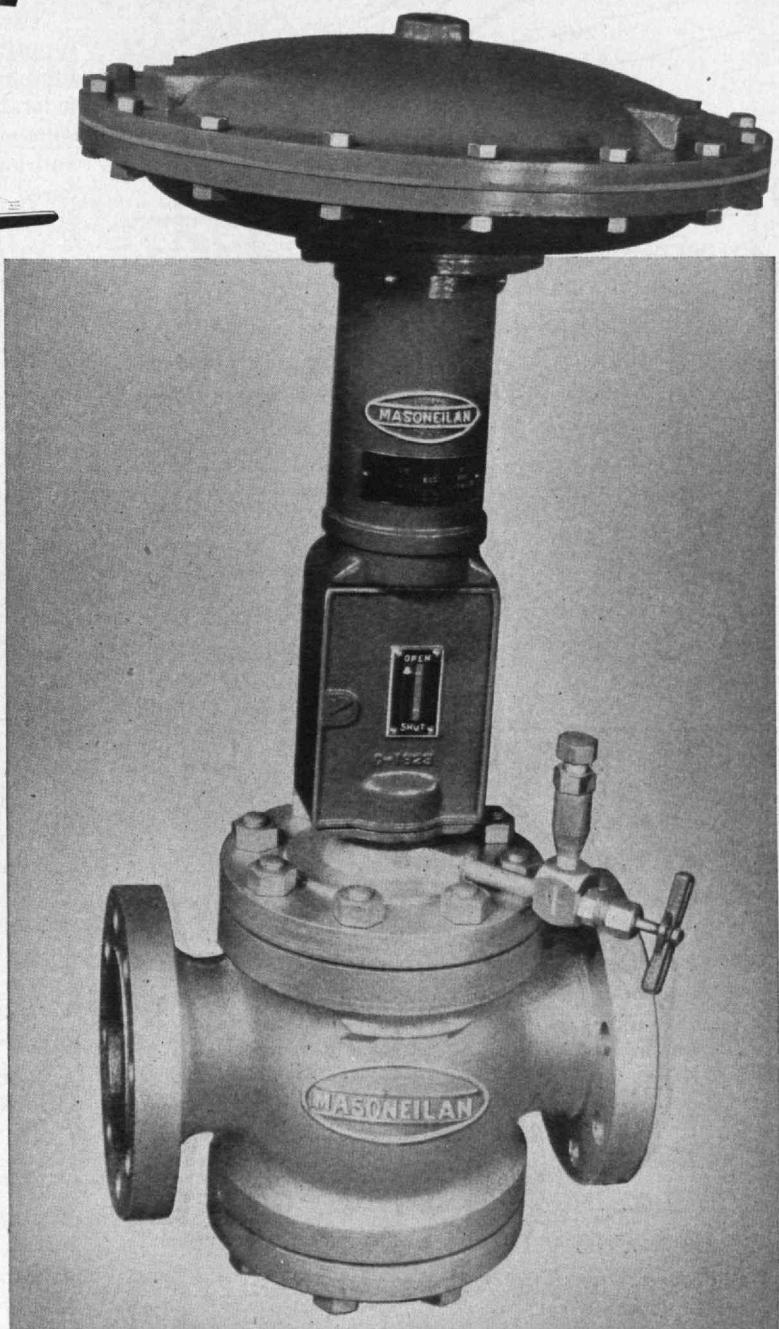
*There Can't Be Any Guess in this Gas**



*High octane gasoline used by our war-birds must be *right*. There can't be any guessing when not only life but victory is at stake. That's why automatic controls are so important in the petroleum industry.

AND that's why many refineries use Masoneilan Control Valves. Their performance and their sturdy construction have won them a top spot in the process industries.

Which in turn is why some of our friends may not have been able to get these valves when they wanted them. Naturally the most vital war-winning plants come first. If you have been disappointed remember that Masoneilan valves probably have helped produce much of the high octane gas that, night and day, propels our planes over Hitler-land with presents for Adolf.



REGULATING

Mason-Neilan Regulator Company
Boston, Massachusetts

Tools of Tomorrow—at work TODAY

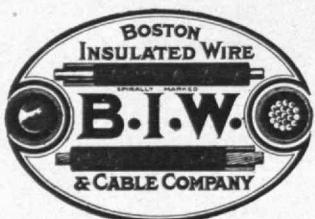
ALTITUDE
—the new dimension
in our lives

GLOBE encircling airlines carry war material to all the fighting fronts. Time has been compressed so that no spot on the earth is farther than 60 hours away. *Distance* has become *space* to the average man and altitude is the new dimension.

This progress has been made possible in part by flight instruments which measure accurately and record the position of a plane

above sea level—above the surface of the earth. From the research laboratories of Lane-Wells Company, improvements in flight instruments have been developed to aid aerial navigation and promote the safety of flight operations.

FIGHTING
Tomorrow's Tools—Today!
LANE-WELLS
COMPANY
Los Angeles Houston Oklahoma City

ELECTRIC CABLES
for AIRCRAFT

LIGHTING AND POWER CABLES
SHIELDING IGNITION CABLE
BONDING WIRE ANTENNA WIRE
INSTRUMENT WIRES AND CABLES

Manufactured in accordance with latest Army and Navy Specifications

Special multiple conductor cable made to order—designed for particular applications on instruments and apparatus

**BOSTON INSULATED
WIRE AND CABLE COMPANY
BOSTON, MASSACHUSETTS**

CONVERSION AND THE CONFEDERACY

(Continued from page 158)

versity and held that post until 1882. He died a year later. His son, Colonel William Gorgas, a gifted medical scientist, became famous for his work in the Panama Canal Zone, fighting yellow fever and other tropical diseases.

Niter was not the only component in grievously short supply. Artillery shells needed detonators, for which fulminate of mercury was the accepted material. The Confederates had to import the mercury needed to make the substance, and the blockade made this impossible. Gorgas and his chief subordinates sought a substitute, and procured one by combining sulphur of antimony and chlorate of potash. So there was no end to detonators.

An almost equally useful improvisation occurred in small-arms ammunition. The stock of percussion caps was running out, and the authorities were hard put to it to keep up even a hand-to-mouth supply of caps through the accustomed handicraft methods of manufacture. But it so happened that among the machinists and mechanics Gorgas sent south to his Augusta enterprise was a mechanic from the railroad repair shops of Lynchburg who was a veritable genius in building new-purpose machinery. He pondered the problem of mass production of percussion caps, and devised and built a machine that could fill and press a million caps a day. Thenceforward the supply of these caps was not a Confederate headache.

The design and production of Confederate naval ordnance were directed by another interesting and highly competent technician, John Mercer Brooke. Not only did he raise the burned and scuttled steam frigate, the U.S.S. *Merrimac*, and convert her into the world's first ironclad, which fought a drawn battle with John Ericson's *Monitor* in March, 1862; but he also designed the best naval gun employed by either navy during the Civil War.

This inventor-administrator was born near Tampa, Fla., in 1826. His father, Brevet Major General George M. Brooke, came from Virginia; his mother came from the state of Massachusetts. The youngster had his first sea service as a midshipman under Farragut in 1841. When the Naval Academy opened at Annapolis, he went there for two years, being graduated as an ensign in 1847.

Brooke's first professional work was with a hydrographic party. In 1851-1853, he was a principal assistant to the famous Matthew Fontaine Maury at the United States Naval Observatory in Washington. During this tour of duty, Brooke invented a deep-sea sounding apparatus which for the first time enabled hydrographic parties to bring up ocean floor specimens from the bottom of the sea. In the late Fifties, he was ordered to take a voyage from California to China to survey a better route for American shipping. He did not get back to the United States until shortly before the outbreak of the Civil War.

In April, 1861, Brooke resigned his commission in the United States Navy, and in September, 1862, became a commander in the Confederate Navy. His first major duty was to raise and rebuild the *Merrimac* and control the work on it until the ship, rechristened the *Virginia*, went into battle under the command of the then Captain Franklin Buchanan on March 8 and 9, 1862.

In reconditioning the raised hull, Brooke employed what he entitled the "submerged ends principle," of

(Concluded on page 162)

Said the Hatter...



Gunmaker...



and Food-Packer...

to the man with the *new-product headache*:



For nearly seventy years, scores of manufacturers in every line of industry . . . in peacetime and in war . . . have brought to Taft-Peirce their knotty problems in design, development, tooling, and contract manufacturing. Their reasons have been as varied as their products . . . lack of plant facilities . . . lack of manpower . . . and, very often, a lack of experience in the new fields they planned to enter.

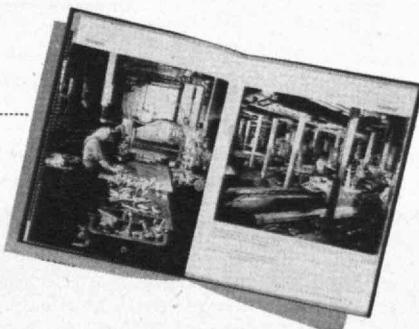
Here, in the Taft-Peirce Contract Division, they have had their lacks supplied by a compact, mobile organization with an all-inclusive store of experience, and a

plant equipped to produce *economically* anything from a single production tool to complete mechanisms, machines, or products in carload lots. No job is too large, none is too small, and any phase of Taft-Peirce Contract Service may be engaged without the others.

Today, the roster of Taft-Peirce contract clients has extended so widely that it has become almost a country-wide commonplace to advise: "If you have a good idea—but not the time or experience to develop, tool up, or build it—then *Take It To Taft-Peirce*."

Taft-Peirce Contract Service . . .

is described and illustrated in this interesting gravure volume, a copy of which you may obtain by writing on your letterhead to: *The Taft-Peirce Manufacturing Co., Woonsocket, Rhode Island*.





Reg. U. S. Pat. Off.

Samson Cordage Works

Boston, Mass.

Herbert G. Pratt, '85, Chairman of the Board

Manufacturers of braided cords of all kinds, including sash cord, clothes line, trolley cord, signal cord, shade cord, Venetian blind cord, awning line, etc., also polished cotton twines and specialties.

SAMSON SPOT CORD



Reg. U. S. Pat. Off.

Our extra quality sash cord, distinguished at a glance by our trade-mark, the colored spots. Especially well known as the most durable material for hanging windows, for which use it has been specified by architects for more than half a century.

CONVERSION AND THE CONFEDERACY

(Concluded from page 160)

which he thought so much that he applied for a patent, and Stephen R. Mallory, the Secretary of the Navy, issued him Confederate Patent No. 100 therefor. Case-mates replaced the frigate top; their sides, inclined about 36 degrees, were made up of two layers of 12-inch timbers, covered with two layers of 2-inch iron sheets. A heavy iron wedge was inserted at the prow, for a ram. The ship was given a battery of six 9-inch Dahlgren smoothbores and four of Brooke's new naval rifles.

The designer-inventor went to the Tredegar Iron Works at Richmond so that he could personally superintend the preparation of the armor and plate for converting the old frigate into an armored man-of-war. When put to the test, everything worked well except the marine engines. Their replacement or repair was beyond the ability of the engineering shops at the Norfolk Navy Yard. Engine trouble crippled the *Merrimac* in the duel with the *Monitor*.

In March, 1863, Secretary Mallory appointed Commander Brooke chief of the bureau of ordnance and hydrography of the Confederate Navy. He handled this important task with great ability until the Confederate Government fled from Richmond early in April, 1865.

Reference has already been made to the Brooke gun as a part of the battery of the reconstructed *Merrimac* in 1862. The gun was considered at the time a distinct improvement on either of the two chief types of naval ordnance in use in the United States Navy, the smoothbore Dahlgren cannon and the Parrott rifle. Both of these were cast guns, as a result of which fact the powder chamber pressures which they could resist were limited. Both their range and accuracy of fire were thus impaired. Brooke's new gun barrel was cast, but he had undertaken to strengthen it by shrinking wrought-iron hoops or jackets on the outside, thus providing reinforced strength against greater powder pressures inside the gun. In addition, the powder chamber was so shaped that it served as an "air brake" to cut the initial tension of the gases. The new gun proved admirable in service. The *Merrimac* gunners used it most successfully, and later Confederate men-of-war did great execution with it. Admiral Buchanan's armored ram, the *Tennessee*, which did such damage to Farragut's fleet in the Battle of Mobile Bay in 1864, had a main battery of Brooke guns.

Commander Brooke proved most efficient in the exercise of his duties as chief of ordnance for the Confederate Navy. He gave active support to the development of torpedoes for use by Confederate naval and coast forces against the Federal blockaders. The result was torpedoes better than the world had known before, the employment of which sent several United States vessels to the bottom. He also did what he could to help experiments in Charleston Harbor on a submarine which had some small measure of promise through actual employment against ships in Admiral Dupont's squadron. Brooke ran his office well, and enjoyed the confidence of President Davis as well as Secretary Mallory and the chief fighting admirals of the Confederate Navy. After the war, he became a professor at Virginia Military Institute at Lexington, and served there many years. He died in 1906.

HELPING TO "LIQUIDATE" THE AXIS

- Parachute Flares
- Naval Ammunition Hoists
- Navy Mines
- Armor Piercing Shot
- Anti-aircraft Gun Bases
- Scullery Sinks
- **COMMERCIAL GASES**

Carbon Dioxide (CO₂)

Oxygen

Acetylene

Hydrogen

Nitrogen

Dry Ice

- Tank Turret Parts
- Airplane Controls and Collector Rings
- Machine Gun Turrets, Magazines and Ammunition Boxes
- Machine Tool Parts
- **MEDICAL GASES**

Ethylene, Oxygen, Helium

Helium-Oxygen Mixture

Oxygen-Carbon Dioxide Mixture

Nitrous Oxide

Carbon Dioxide

PEACETIME PRODUCTS

Beverage Bottling Machinery
Refrigerated Dispensing Equipment

Extracts and Flavors
Welding Equipment

The Liquid Carbonic Corporation

3110 South Kedzie Avenue, Chicago, Illinois

Branches in Principal Cities of the United States and Canada

RATING DATA

Voltage and Wattage Ratings:—

Resistance Value
Up to 1.9 megohms
2.0 to 10 megohms
Above 10 megohms

Resistance Value
Up to 3.9 megohms
4.0 to 20 megohms
Above 20 megohms

Temperature Rating:—
Maximum recommended hot spot temperature for continuous operation: 130°C (Ambient plus rise).
Maximum recommended ambient temperature for full wattage ratings: 70°C.

Temperature Coefficient:—
Approximately .04% per degree C between 20°C and 130°C.

TYPE 1

Maximum Wattage Rating

12 watts
9 watts
based on voltage

R.M.S. Voltage Rating
based on wattage
9 kv. max.
10 kv. max.

TYPE 2

Maximum Wattage Rating

22 watts
15 watts
based on voltage

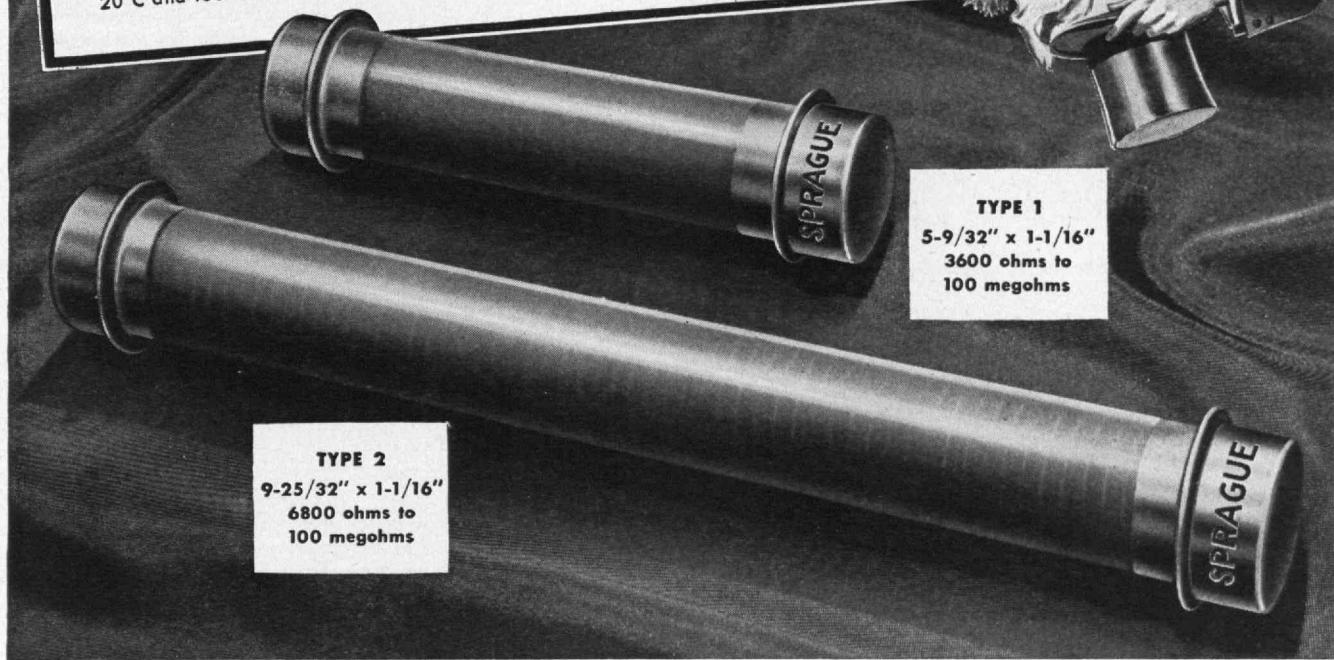
R.M.S. Voltage Rating
based on wattage
15 kv. max.
20 kv. max.

Resistance Tolerance:—
Minimum acceptable tolerance $\pm 10\%$.

Construction:—

- (a) Hermetically-sealed to withstand salt water immersion tests.
- (b) Designed to withstand aircraft vibration and 10g acceleration tests.

A problem solved, designed, and produced in ninety days—and made possible by longstanding research and experience.



SPRAGUE MEG-O-MAX

HIGH-RESISTANCE, HIGH-VOLTAGE RESISTORS

Less than 3 months from the presentation to Sprague Koolohm Resistor engineers of the problem of designing high-resistance value units capable of dissipating power at voltages up to 20 kv. and at high ambient temperatures, the first Sprague Meg-O-Max Resistors were on the job! Moreover, they used practically no critical materials, were of smaller physical size, and presented a degree of resistance stability and mechanical ruggedness not available in other units, exclusive of costly wire-wound meter multiplier types!

Entirely unique in construction, Meg-O-Max Resistors are formed of a series of molded segments. These are joined non-inductively, and the assembly is then encased in a hermetically-sealed, rugged glass envelope provided with ferrule terminals to withstand aircraft

vibration tests, salt water immersion tests, and tests for mechanical shock produced by rapid acceleration.

In addition to use as a high-voltage bleeder and as a broad accuracy meter multiplier for a voltage indicator, Meg-O-Max Resistors find many applications in measuring instruments, rectifier systems, high-voltage dividers, and as broad accuracy meter multipliers. Specify Meg-O-Max for High-Resistance—High-Voltage requirements.

Data sheets gladly sent upon request. Samples sent only on firm's request, giving details of application.

SPRAGUE SPECIALTIES COMPANY

Resistor Division • North Adams, Mass.

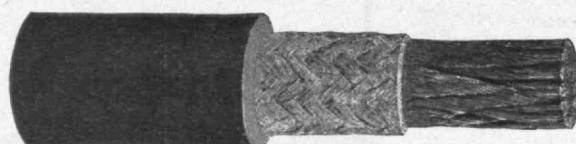
A NEW DEVELOPMENT BY THE MAKERS OF

KOOLOHM
TRADEMARK REGISTERED

INSULATED WIRE-WOUND RESISTORS

SIMPLEX-TIREX

Electric Welding Cables



... for shipyards, railroads, pipe lines and any construction or repairs where electric welding contributes to efficient production.

Subject to W.P.B. regulations

SIMPLEX WIRE & CABLE CO.

79 Sidney Street, Cambridge, Mass.

57 years' experience

10 REPRODUCTION PROCESSES

At your Service

LIB. 3000.

May we help
— solve your problem —

SPAULDING - MOSS CO.

42 Franklin Street
263 Park Sq. Building

113 Purchase Street
Boston, Mass.

MAIL RETURNS

(Concluded from page 128)

Egypt, the country that so far is the only one which can produce the long staple cotton used in the making of automobile tires, raises this cotton on lands that annually are flooded by the Nile River, and the people of Egypt pray every year for the Nile to overflow. Here in this country we build dikes to keep the water from flooding the farms.

We have been warned that in the next 75 years the famous Mississippi Valley will become a barren waste. But who has attempted to dissuade authorities from keeping the Mississippi River from flowing over the lands and fertilizing them with the rich mud that the river with its dikes is now carrying into the Gulf of Mexico, where it is lost forever?

As people, we become locally selfish when we allow or advocate the building of dikes to prevent the flooding of small sections of our town in which no building should ever have been erected. Do we realize that by so doing we are burdening communities farther down the river with an extra volume of water on top of the already flooded river instead of permitting this water to store itself naturally and flow off gradually?

Harrisburg had a 33-year-cycle flood in 1936. Some of the generation of engineers who will be here in, say, 1969 will experience the evil effect of the dikes built or being built on the upper reaches of the Susquehanna. Even before then, minor floods will occur.

Engineers building flood control dams have failed to take into account the fisherman. Every such dam built, including the largest one above Pittsburgh, the construction of which I advocated, has proved a total failure for the reason that a flood dam should be kept normally empty and be permitted to fill only during floods. But the fishermen, who are not without political influence, demand that these dams be kept filled for their pleasure. So that is that.

In conclusion, if we refrain from building either dikes or flood control dams at floodtimes, the people will in a future emergency have time to move to higher land and no lives will be lost. But if we hold the floodwaters back with man-made dams or dikes and permit the people to feel secure in their homes, then when these dams or dikes break, the loss of life is shocking.

Which should it be, people or property?
Harrisburg, Pa.

Fitting

FROM S. W. BENTON:

In the light of Fred Kelly's judicious appraisal of the Wrights' invention of the flying machine, in his very interesting article in your December issue, it seems to me to be extremely fitting that the original *Wright Flyer* is to be brought back to its native country as soon as circumstances will allow. Everyone who is proud of American ingenuity and inventiveness will look on the machine as a memento of one of the most impressive moments in the nation's history.

Spring Valley, N. Y.

New Products

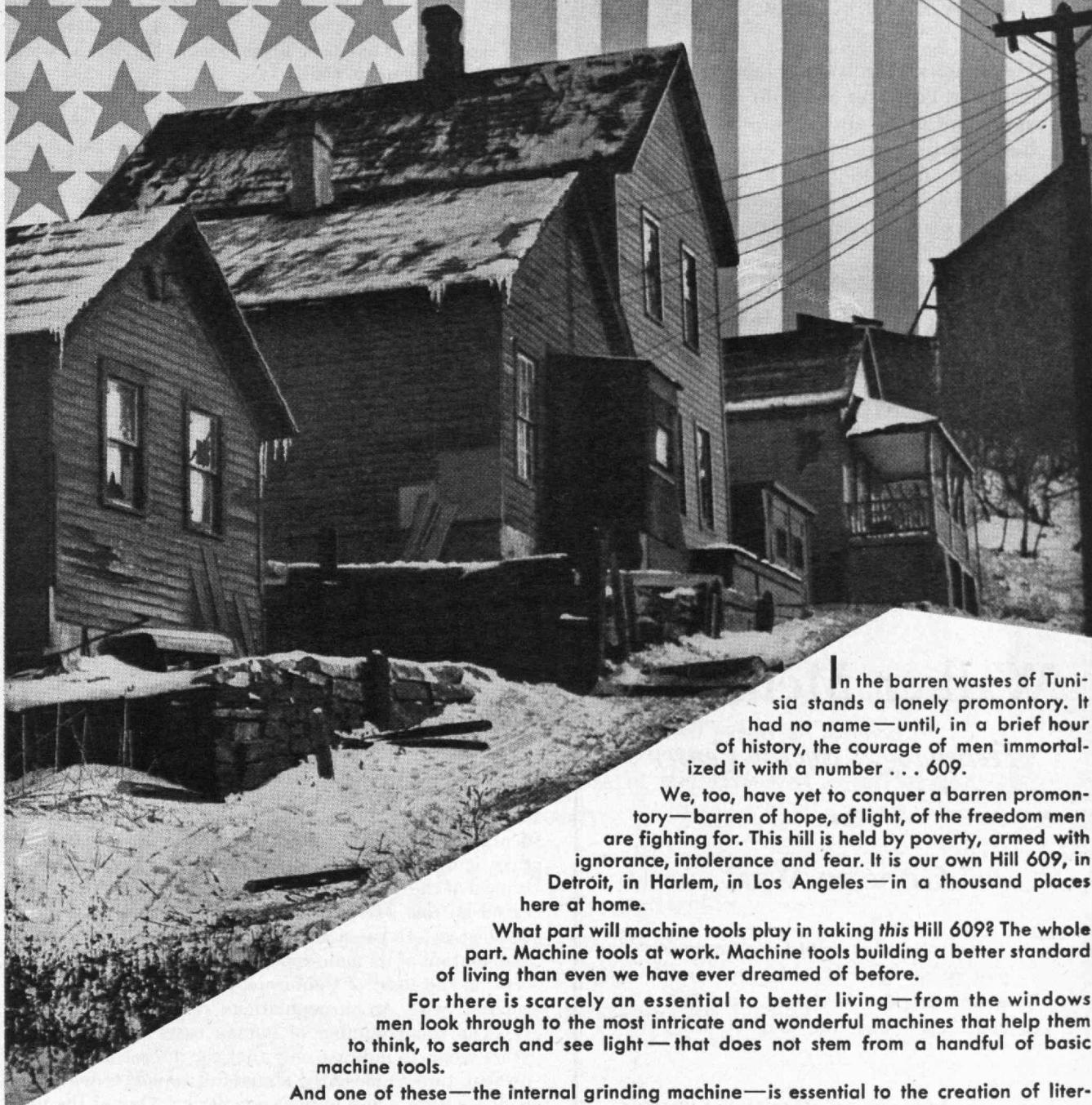
A well established company with modern laboratories and an extensive sales force in various industries would welcome the opportunity to consider new ideas, chemicals or raw materials, with the view of assisting in their development and commercialization.

Reply to Box A

THE TECHNOLOGY REVIEW
M.I.T., CAMBRIDGE 39, MASS.

What part will machine tools play in helping to take

this HILL 609?



In the barren wastes of Tunisia stands a lonely promontory. It had no name—until, in a brief hour of history, the courage of men immortalized it with a number . . . 609.

We, too, have yet to conquer a barren promontory—barren of hope, of light, of the freedom men are fighting for. This hill is held by poverty, armed with ignorance, intolerance and fear. It is our own Hill 609, in Detroit, in Harlem, in Los Angeles—in a thousand places here at home.

What part will machine tools play in taking this Hill 609? The whole part. Machine tools at work. Machine tools building a better standard of living than even we have ever dreamed of before.

For there is scarcely an essential to better living—from the windows men look through to the most intricate and wonderful machines that help them to think, to search and see light—that does not stem from a handful of basic machine tools.

And one of these—the internal grinding machine—is essential to the creation of literally everything that will make for a better living after this war.



BRYANT CHUCKING GRINDER COMPANY

SPRINGFIELD
VERMONT, U.S.A.



Hevi Duty Electric Co. Electric Furnaces

MILWAUKEE, WISCONSIN

Hevi Duty Precision Electric Heat Treating Furnaces are built in a large variety of types and sizes — for many heat treating operations — with temperature ranges to 2500° F. (1371° C.). They are standard production equipment in many national industrial plants.

Write for descriptive bulletins

HAROLD E. KOCH '22, President

GEORGE A. CHUTTER '21, Vice-President

ELTON E. STAPLES '26, On Leave, U.S. Army

BRUNO M. WERRA '32, Director of Research

NO MORE CLASS OR SOCIAL
FUNCTIONS FOR THE DURATION

Walker Memorial Technology's Social Center

has

Gone to War!

The management thanks you for your past patronage and anticipates once again being the "Home for your Class Functions" after the war is won.

WALKER MEMORIAL DINING SERVICE

M. I. T.

Cambridge, Massachusetts

A. W. BRIDGES, *Mgr.*

THE TREND OF AFFAIRS

(Continued from page 136)

boundary of Montana. It has once been reported in extreme northwestern North Dakota. It is only a matter of time before the disease will be reported from the tier of states south of North Dakota, since it has practically reached the Texas border. Why, then, does plague not appear more often in man? Since 1940, about six such cases have been reported in western United States. With the exception of one near Boise, Idaho, they all occurred in Siskiyou County, Calif.

Plague does not seem to appear in the human population until the disease reaches a rather high level in the contiguous rodent population. There must also be present at the same time those sorts of fleas which are capable of transmitting plague from rodent to man. The plague bacilli have the power of multiplying in the intestine of the flea. In some species, this results in plugging the gut. When such a flea tries to feed, it often vomits up blood and bacilli, and the latter may enter the human body through the flea bite or the flea may be crushed and the germs set free. Experiments indicate that plague is most efficiently carried by those kinds of fleas which suffer this blockage of the gut. Although the tropical rat fleas which are mostly associated with domestic rodents are the best-known transmitters, several fleas on our own wild rodents are effective. The rat fleas mentioned are more prone to transmit from rodent to man since they do not object to biting man. In some epidemics, plague of the lungs (pneumonic plague) occurs and is passed directly from victim to victim without the help of fleas. The death rate for this form is, as a rule, very high.

It is not unlikely that almost any rodent is capable of contracting plague, and some 20 kinds of wild rodents in the western United States have been found infected. For the most part, these are ground squirrels and prairie dogs. Perhaps their somewhat sociable habits make for an easier spread of the disease than we find in rabbits and mice, but it is not by any means unknown among the latter types.

The outlook for plague in North America can be based on four facts: (1) The known area of distribution of rodents has increased much faster in the last eight years than it did in the preceding 30 years. This situation is typical of the spread of an introduced organism. (2) There exists no real barrier to the further eastward spread of the disease. It has not yet reached the eastern limits of distribution of its main rodent hosts in the West. (3) Except on the coast of California, it has scarcely come into contact with large populations of domestic rodents. (4) The small number of human cases in the last few years seems to indicate only that the disease is not at the present time sufficiently abundant among rodents in a region with a dense human population. One of the most recent cases was in a man who had been hunting ground squirrels.

We may conclude that ere long the plague will meet the larger populations of domestic rats in the relatively populous cities just west of the Mississippi. The rats there have been long free of the disease and should be

(Concluded on page 168)

ESTABLISHED 1818

Brooks Brothers,
CLOTHING,
 Men's Furnishings, Hats & Shoes

MADISON AVENUE COR. FORTY-FOURTH STREET
 NEW YORK

IT PAYS TO BE SURE

One of the many great advantages in doing business with Brooks Brothers through these difficult times is the certainty that whatever you purchase is right. Any investment you make in things from this store will stand up in value and pay substantial dividends in use, wear, and general satisfaction.

Good taste, sound judgment and an unsurpassed experience in picking the right things all play their part in the selection of every article of merchandise offered for sale.

*Now in the Second Quarter of our
 Second Century 1818-1944*

BRANCHES
 NEW YORK: ONE WALL STREET
 BOSTON: NEWBURY COR. BERKELEY STREET

Air Conditioning Synthesis

SOMETIMES when we are asked what arts and sciences are synthesized in scientific air conditioning, we hardly know what to answer.

After listing the obvious ones, we look at the titles of some of the books we use in our reference library:

STEAM POWER STATIONS
 CHEMICAL ENGINEERING PLANT DESIGN
 FORMULAS FOR STRESS AND STRAIN
 MATHEMATICS FOR ENGINEERS
 AIRPLANE STRUCTURAL ANALYSIS AND DESIGN

Would you believe it?

HAROLD J. RYAN, INC.

101 Park Avenue, New York City

BLUEPRINTS VS. BOTTLENECKS

Don't allow delay in receiving blueprints to hold up production.

Such hold-ups stymie your efforts as much as delayed materials.

ELECTRO SUN SERVICE means you receive prints on time.

Also, we have a complete plant for **PHOTO PRINTS** and **OFFSET PRINTING**—all under one roof.

WE'LL HELP KEEP 'EM ROLLING AND FLYING

ELECTRO SUN CO., INC. NEW YORK, N.Y.

PHOTO LITHOGRAPHS • BLUEPRINTS • PHOTO COPIES • LITHOPRINTS
161 WASHINGTON STREET GRAND CENTRAL TERMINAL BLDG.
Barclay 7-2334 MUNray Hill 6-6526

J. C. DUFF '86

A. L. WEIL '01

To Tech Men and Others—

If you have trouble with your **PACKING FOR VALVES, PUMPS** and other machinery consult

HENRY D. JACKSON '95
29 NOYES STREET, CONCORD, NEW HAMPSHIRE

THE TREND OF AFFAIRS

(Concluded from page 166)

ripe for their own private epidemic, which they probably will not keep to themselves. There will be outbreaks in man which, after a time, will subside. Once established in a sizable population of domestic rodents, the disease should continue its eastward march without further difficulty.

In these conclusions of course lies the obvious and inescapable further conclusion that the course of wisdom is to start and to continue actively the common sense methods of precaution and prevention.

Cohue

GLASS fibers are used as reinforcement in a new plastic material employed in aircraft construction, experimental samples of the combination having been produced with tensile strengths of more than 80,000 pounds per square inch. Impact resistance of more than 20 foot-pounds, as compared with about two foot-pounds reported for untreated plastics in a standard test, has been shown by test samples of the new compound. **¶** Dehydration's progress during the year past is suggested by figures showing that hardly any meat was so processed in 1942, that 60,000,000 pounds were handled in 1943, and that 18 plants dried 10,000,000 pounds of eggs in 1940 as against 315,000,000 pounds dehydrated by 94 plants during 1943. **¶** A synthetic rubber is used to line the concrete walls of underground tanks for the storage of fuel oils. Heavy fuels were no problem but when lighter oils such as Diesel fuel and aviation gasoline showed a tendency to seep through the pores of the concrete, research produced a lining which is cemented to the tank walls much as wallpaper is hung in decorating a dwelling house.

PREPARATORY SCHOOLS FOR BOYS

CHAUNCY HALL SCHOOL

Founded 1828. The School that confines itself exclusively to the preparation of students for the Massachusetts Institute of Technology.

FRANKLIN T. KURT, Principal

553 Boylston Street, Boston, Mass.

HUNTINGTON SCHOOL FOR BOYS

Four forms beginning with 9th grade.
Thorough preparation for entrance to M.I.T.
and other technical schools.
Regular and accelerated courses.

Arthur E. Newcomb, Jr., Ed.M., Principal
320 Huntington Ave., Boston
Tel. Kenmore 1800

Boit, Dalton & Church INSURANCE

89 BROAD STREET
BOSTON, MASS.

Hubbard
3100

KENmore 0119

KENmore 0120

HARTY-BLANEY CONSTRUCTION CO.

25 Huntington Avenue

Boston

Massachusetts

Walter C. Blaney

John J. Harty '13

The
RUMFORD PRESS

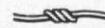
CONCORD
 NEW HAMPSHIRE



WHERE
Printing
 IS STILL A CRAFT



When the big war job is
 done there will be plenty
 of Pequots for waiting
 millions of housewives.



PEQUOT MILLS
 Salem, Mass.

HENRY P. BENSON
 President

— Class '86

McCREERY and THERIAULT

Building Construction

131 CLARENDON STREET

BOSTON, MASS.



WILLIAM D. NEUBERG COMPANY

Chemicals

GRAYBAR BUILDING · 420 LEXINGTON AVE.
NEW YORK, N. Y.
TELEPHONE LEXINGTON 2-3324



William H. Coburn, '11

William F. Dean, '17

William H. Coburn & Co.

INVESTMENT COUNSEL

68 Devonshire St.

Boston, Mass.



Transits and Levels are used on all largest works and by U.S. Govt. for utmost precision. Rental Insts. New catalog, just issued, sent gratis. A souvenir plumb-bob sent for 3¢ postage.
BUFF & BUFF CO. Boston 30, Mass.
Henry A. Buff '05

POST WAR

ELECTRICAL K-A WARP STOPS

Trade Mark Reg. in U. S. Pat. Off.

Will enable all sorts of looms to weave
"Better Cloth at Less Cost"

R. I. WARP STOP EQUIPMENT CO.

PAWTUCKET, RHODE ISLAND

MONSANTO CHEMICAL COMPANY

Merrimac Division

EVERETT
MASSACHUSETTS

The largest and oldest
chemical manufacturer in New England

THE INSTITUTE GAZETTE

(Concluded from page 148)

that though Hitler had realized this fact, Hitler had evidently far underestimated what the scientists and engineers arrayed against him would be able to accomplish.

English in Wartime

WARTIME problems of the teaching of English and history at the Institute were surveyed by Philip W. Moore, '01, chairman of the Corporation Visiting Committee on the Department of English and History during 1942-1943, in a recent report summarized below:

Soon after the last meeting of the Visiting Committee on the Department of English and History in March, 1942, the Department offered an option in American history, designed to give the students a better conception of American history and traditions than they might have acquired from the conditions under which they grew up. It was a fortunate move, because the option with slight modifications fits the Army and Navy first-year programs. A broader course in the same subject is offered to all civilians at the Institute. Since the servicemen enrolled in these courses have had a great variety of educational background; since no time is available for outside preparation of classwork and everything must be done in the classroom; and since fatigue has been in evidence to some degree, some concern was felt that the servicemen might not do so well in these courses as the civilians. Last August, however, after the courses had been in operation for 11 weeks, the records of such men compared favorably with those of the civilians.

The staff of the Department has been increased somewhat to take on the added load, but even so, with four full sections, each member of the staff carries 12 hours of teaching a week. Two members of the Department of Modern Languages and one from the School of Architecture are lending part of their time to the teaching of English and history.

It might well have been expected that the demands of the War Department and the Department of the Navy upon their personnel enrolled at the Institute would be so heavy as to bring about the abandonment of much of the material taught in this Department. Fortunately, however, the Department was able to present its subjects in such a way that continuation of its courses was found well worth while. The spirit of the Department is excellent.

PERSONAL RESEARCH into the future
leads to life insurance as the solution to freedom from want

STANLEY W. TURNER '22

former student of M. I. T. will be glad
to give you the facts.

Telephone CAPitol 0456 or address
30 State Street, Boston, Mass.



**PROVIDENT MUTUAL
LIFE INSURANCE COMPANY**
OF PHILADELPHIA, PENNSYLVANIA

PROFESSIONAL CARDS

JACKSON & MORELAND Engineers

Public Utilities — Industrials
Railroad Electrification
Design and Supervision — Valuations
Economic and Operating Reports

BOSTON

NEW YORK

H. K. BARROWS, '95

M. Am. Soc. C. E.

CONSULTING HYDRAULIC ENGINEER

Hydro-electric Developments — Water Supplies. Reports, Plans, Supervision. Advice, Appraisals.

6 BEACON STREET

BOSTON, MASS.

EADIE, FREUND AND CAMPBELL CONSULTING ENGINEERS

110 WEST FORTIETH STREET NEW YORK CITY
Plans and Specifications — Examinations and Reports
Power, Heating, Ventilating, Electric, Plumbing,
Sprinkler, Refrigerating, Elevator Installations, etc.,
in Buildings and Industrial Plants

J. K. CAMPBELL, M. I. T. '11

STARKWEATHER ENGINEERING CO. INCORPORATED

Engineers and Contractors for Pumping Plants
Boiler and Power Plants, Cooling Water
and Heat Recovery Systems

246 Walnut Street, Newtonville BIGelow 8042
Wm. G. Starkweather, M.E. J. B. Starkweather, B.S.
Cornell '92 M.I.T. '21

H. A. KULJIAN & CO. CONSULTANTS • ENGINEERS • CONSTRUCTORS

Specialists in
UTILITY, INDUSTRIAL and CHEMICAL FIELDS
1518 WALNUT STREET PHILADELPHIA, PA.
H. A. KULJIAN '19

FABRIC RESEARCH LABORATORIES

INCORPORATED
Research, Testing and Consulting
for Textile and Allied Industries

665 Boylston Street Boston, Mass.
W. J. HAMBURGER, '21 K. R. Fox, '40 E. R. KASWELL, '39

GILBERT ASSOCIATES, INC.

ENGINEERS AND CONSULTANTS
Allen W. Reid '12 Malcolm G. Davis '25 F. E. Drake '05
Vice President
Steam, Hydro, Diesel Power Plants; Industrial Structures;
Plant Safety, Labor Relations, Utility Rates, Valuations,
Reports; Large Scale Purchasing; Industrial Laboratory

New York Reading, Pa. Washington
61 Broadway 412 Washington St. Nat'l Press Bldg.

FAY, SPOFFORD & THORNDIKE

ENGINEERS BOSTON, MASS.

BRIDGES WATER SUPPLY AND SEWERAGE
PORT AND TERMINAL WORKS
FIRE PREVENTION
INVESTIGATIONS DESIGNS
SUPERVISION OF CONSTRUCTION

STANLEY G. H. FITCH '00

CERTIFIED PUBLIC ACCOUNTANT

of PATTERSON, TEELE & DENNIS, 1 Federal Street, Boston, Mass.
Cost Accountants and Auditors — Tax Consultants

NEW YORK BOSTON WASHINGTON
REPRESENTATIVES IN OTHER PRINCIPAL CITIES OF THE
UNITED STATES, CANADA, ENGLAND AND AUSTRALIA

MAURICE A. REIDY Consulting Engineer

BRIDGES BUILDINGS
STRUCTURAL DESIGNS FOUNDATIONS
CONSTRUCTION CONSULTANT AND ARCHITECTURAL ENGINEER
Estimates and Appraisals

44 SCHOOL STREET BOSTON, MASS.

THE COSMA LABORATORIES CO. 1545 East 18th Street Cleveland 14, Ohio

Chemical Analysis — Testing — Consulting Engineering
Testimony and Research

H. SEYMOUR COLTON, M.I.T. '21 R. W. FRISCHMUTH, Case '38
Director Assistant Director

MORAN, PROCTOR, FREEMAN & MUESER CONSULTING ENGINEERS

420 LEXINGTON AVENUE NEW YORK CITY
Foundations for Buildings, Bridges and Dams;
Tunnels, Bulkheads, Marine Structures;
Soil Studies and Tests;
Reports, Design and Supervision.

WILLIAM H. MUESER, '22

CALIBRON PRODUCTS, INC.

Industrial Physics
Mechanics Apparatus
and Electricity Built to Order
"GUARANTEED RESEARCH" — An Unusual Service

51 Lakeside Avenue West Orange, New Jersey

HOMER T. BROWN CO.

Real Estate Brokers Property Management
Appraisals and Mortgages
1320 BEACON STREET BROOKLINE, MASS.
Edgar P. Palmer '25 William W. Russell '22

AN AID TO INDUSTRY IN LOCATING OUTSTANDING MEN**INDUSTRY IS LOOKING FOR:**

Communication Engineers • Field Engineers • Industrial Engineers • Mechanical Engineers • Physicists • Sales Managers
Technical Salesmen

For Further Information

WRITE

PLACEMENT BUREAU

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CAMBRIDGE 39, MASS.

AN AID TO ALUMNI IN FINDING DESIRABLE POSITIONS

IMPORTANT INFORMATION

for

ALL M.I.T. MEN

1944 ALUMNI DAY

will be held on

SATURDAY, FEBRUARY 26

The date for Alumni Day, originally scheduled to be held on March 4, 1944, has been changed to Saturday, February 26, so that members of the Class of 1944 may attend the Annual Alumni Banquet as guests of the Alumni. Most members of the class of 1944 will leave for military service after graduation exercises, which are to be held on February 28.

Alumni Day for 1944 will consist of two events: Class Day exercises in the afternoon, and the Stein-on-the-Table Banquet in the evening. Class Day exercises will be held at 2:00 P.M. in the Auditorium of the New England Mutual Life Insurance Company Building which is located on the site of the "Tech on Boylston Street." The traditional Stein-on-the-Table Banquet is scheduled for 7:00 P.M. at the Hotel Statler, Boston.

Remember

♪♪ It's Always Fair Weather ♪♪

When Good Fellows Get Together

on

ALUMNI DAY

SATURDAY, FEBRUARY 26, 1944

TECHNOLOGY MEN IN ACTION

THE ALUMNI FUND — ITS PROBLEMS AND GROWTH

GIFTS AND TAXES

Everyone who pays an income tax realizes that charitable gifts are deductible up to 15 per cent of net income. Most of us, however, have not stopped to figure out the net cost of making such a gift. Recently, Prentice-Hall, Inc., prepared a chart which will be of more than passing interest to some. While it applies to the year 1943, it is anticipated that future changes in income tax procedure will, if anything, lower the net costs shown here.

<i>Net income before deducting personal exemption or credit for dependents</i>	<i>Net cost of gift of \$100</i>	<i>Net cost of gift of \$500</i>	<i>Net cost of gift of \$1,000</i>	<i>Limit of deductible gift (15 per cent of Column A)</i>	<i>Gift of Will cost</i>
\$ 3,000	\$81.60				
4,000	78.60				
5,000	78.60				
7,000	74.60	\$373			
10,000	66.60	333	\$674	\$1,500	\$1,027.00
15,000	58.00	290	580	2,250	1,330.50
20,000	48.00	240	486	3,000	1,512.00
25,000	42.00	210	420	3,750	1,633.50
35,000	36.00	180	360	5,250	1,993.50
50,000	31.00	155	310	7,500	2,379.00
100,000	17.00	85	170	15,000	2,674.00

WITH THE CLUBS

On the record, no changes in position have occurred since the last report was made in the November issue, but the three leaders are now blanketed so closely that it's difficult to tell which is which. On the basis of per cent of contributors alone, Western Penn still leads; but considering the splendid figure Philadelphia has piled up for an average, it might well claim supremacy. Whatever interpretations are placed on these figures, they are all good — and Northern New Jersey is gaining all the time.

A new entrant, Kansas City, has just appeared and will be included in next month's listing. All but two of the participating Clubs lead the general figure for Alumni as a whole, the first four being almost double. Five are ahead in average amount. Congratulations! And there are still three months to go!

The figures on November 30 were:

	<i>Per cent of contributors*</i>	<i>Average contribution</i>
Western Pennsylvania	53.6	\$13.30
Rhode Island	53.3	14.10
Philadelphia	52.5	16.50
Northern New Jersey	48	13.00
Cincinnati	34	9.70
Buffalo	30	14.30
Central Pennsylvania	21	9.70
Dallas	18	8.80
Alumni body as a whole	25	\$12.00

* Based on number of active members.

TECHNOLOGY MEN IN ACTION

M.I.T. MEN AT WAR

Up to December 1 over 5,200 Institute Alumni, including 18 Admirals, one Commodore, and 63 Generals, were recorded as being in the active services of the United Nations. New additions to the list of Alumni in the High Command include Rear Admiral Forrest P. Sherman '17, Rear Admiral Lawrence B. Richardson '21, Brigadier General John W. Coffey '23, Brigadier General Walter F. Kraus '25. To date 40 Alumni have received military decorations.

Beginning with the November 1942 issue, The Review has included a listing of "M.I.T. Men at War." Corrections and additions to this list will be published in future issues. As a matter of convenience promotions and corrections in the rank previously given are included under a single heading "Changes in Rank." The Review Editors are greatly indebted to the many Alumni and other readers who are continuing to co-operate so helpfully in reporting inevitable errors of omission and commission which they note in these listings.

Alumni are urged to write to their friends in the services. Letters addressed care of the Alumni Association, M.I.T., will be forwarded.

NEW DECORATIONS

1936 Michel, Norman K., *Sgt.*, U.S.A., Distinguished Flying Cross "for gallantry and extraordinary achievement in aerial flight."

1941 Campbell, Thomas C., Jr., *Lt.*, U.S.A., Distinguished Flying Cross "for raid on the Ploesti Oil Fields." Air Medal and Oak Leaf Cluster.

1941 **Murphy, Francis G., *Capt.*, U.S.A., Purple Heart, wounded in New Guinea.

NEW LISTINGS

U.S.A.

1915 Jennings, William, *Maj.*
1916 Baker, Norman D., *Capt.*
1918 Simpson, Charles F., *Maj.*
Van de Linda, Lloyd B., *Capt.*
1921 Gould, Sydney W., *Capt.*
Jason, Justin F., *Capt.*
1923 Kaufman, David, *Capt.*
1924 Wilkins, Paul L., *1st Lt.*
1925 Sibert, John W., Jr., *Maj.*
1928 Gaffney, Joseph W., *Maj.*
1929 Coe, Thomas H., Jr., *Capt.*
Winer, Isidore, *2nd Lt.*
Wood, Richard D., *Maj.*
Scheuren, John J., Jr., *1st Lt.*
1931 Harney, Patrick J. D., *S. Sgt.*
Hassett, Waman S., *Maj.*
Lalone, Murray J., *Pvt.*
1932 French, Richard S., *Lt.*
Ingram, C. Robert, *Lt.*
King, Charles G., *Maj.*
Moses, Lowell M., *Capt.*
Prescott, Robert S., *Lt.*
Sprague, John S., *Capt.*
1933 Carberry, William H. F., Jr., *S. Sgt.*
Kribben, Bertram D., *1st Lt.*
Mihnos, John W., *1st Lt.*
1935 Revell, George A., *Capt.*
1937 Bordett, Sidney M., *Pvt.*
Ebling, Lewis A., *Pvt.*
Goodwin, Harry B., *Maj.*
Vanderman, Edward J., *Lt.*
1938 Cherry, Allen R., *Sgt.*
Hofstein, Lawrence L., *Pvt.*
Scalingi, Ciro R., *Maj.*
1939 Bagley, Henry C., *Capt.*
Recka, Francis A., *Sgt.*
Martin, John F., *Capt.*
1940 Gillispie, Charles C., *Lt.*
1941 Rice, John D., *Pvt.*
Haac, Hans J., *Pvt.*
1943 Nelson, Robert A., *2nd Lt.*
Osterberg, Wesley H., *Pvt.*
Payson, Eliot C., *Lt.*
Peacock, Andrew C., *A.C.*
Reebie, Robert S., *Lt.*
Stewart, Edwin H., *Lt.*
Swenson, Franklin H., *Lt.*
Warden, Kenneth L., Jr., *Lt.*
Warzeski, Frank S., Jr., *2nd Lt.*
Zeamer, Richard J., *2nd Lt.*

U.S.N.

1917 Judge, Charles E., *Comdr.*
1924 Frank, Charles A., Jr., *Lt.*
1926 Stuart, John, *Lt.*
1927 Marcucella, Francesco, *Lt. Comdr.*
1930 Torchio, Philip, Jr., *Lt. (j.g.)*
1931 Green, Leo A., *Lt.*
1932 Henderson, Frederick R., *Lt. (j.g.)*
1933 Gardner, Herbert S., Jr., *Lt. (j.g.)*
Littmann, Ellis C., *Lt. (j.g.)*
Spinney, Rachel E., *A.S.*

1935 Johnson, Philip H., Jr., *Lt.*
1937 Fraser, Earl D., *Lt. (j.g.)*
Nordstrom, Alfred, *Lt. (j.g.)*
Poehler, Robert S., *Ens.*
West, Robert H., *Lt.*
1938 Hand, Robert S., *Ens.*
James, Harold, *Lt.*
Suter, Daniel E., *Ens.*
Andrias, James, *Ens.*
Bjork, Wilbert M., *Lt. Comdr.*
Friedman, Charles, *Ens.*
Fifield, James E., *A.S.*
Thomas, Theodore D., *Ens.*
1941 Abzug, Malcolm J., *Ens.*
Butman, Robert C., *Ens.*
1942 Darling, Bradford, *Ens.*
Erickson, Bernard E., *Ens.*
Sargent, Frederick, *A.S.*
Skinner, Andrew H., Jr., *Ens.*
1943 Bryant, Carleton F., Jr., *Ens.*
Graves, Gilbert S., III, *Ens.*
Holway, William N., *Ens.*
vonEnde, Carl A., *Lt.*

U.S.M.C.

1933 Reed, William V., *1st Lt.*
CANADA
Army
1939 ★ McRoberts, Clare A., *Flight Officer*

CHANGES IN RANK

U.S.A.
1911 Robinson, Harold L., *Capt. to Maj.*
1922 Bard, Richards J., *Maj. to Lt. Col.*
Connell, Lawrence H., *Maj. to Lt. Col.*
Strauss, Sydney M., *Pvt. to S. Sgt.*

1923 Coffey, John W., *Lt. Col. to Brig. Gen.*
Covell, William E. R., *Brig. Gen. to Maj. Gen.*
Englehart, Alva F., *Lt. Col. to Col.*
1924 Kennett, Walter H., *Maj. to Lt. Col.*
1925 Baker, Hoyt S., *Lt. to Capt.*
Kraus, Walter F., *Col. to Brig. Gen.*
Rowland, Garland T., *Maj. to Col.*
1926 Ash, Maurice L., Jr., *Maj. to Lt. Col.*
Powers, David B., *Capt. to Maj.*
Mankowich, Abraham, *Capt. to Maj.*
Simonson, Cortelyou L., *Capt. to Lt. Col.*
Taminosian, George R., *Lt. to Capt.*
1930 Griffith, William F. R., Jr., *Lt. to Capt.*
1931 Handy, Alden G., *Lt. to Capt.*
Manter, George D., *Lt. to Maj.*
1932 Hall, William P., *1st Lt. to Capt.*
1933 Patterson, Albert M., *Lt. to Capt.*
Snell, Arthur Y., *Capt. to Lt. Col.*
1935 Altglass, Adam, *Capt. to Maj.*
1936 Caldwell, Robert J., *Lt. to Maj.*
Carter, Marshall S., *Lt. Col. to Col.*
Peterson, Francis S., *Lt. to Capt.*
Brown, Chester H., Jr., *Lt. to Capt.*
Corbett, John B., *1st Lt. to Capt.*
Finn, Albert V., *Capt. to Maj.*
Olson, Jorgen B., *Capt. to Col.*
1937 Surbeck, Richard U., *Maj. to Lt. Col.*
Herlihy, John I., *1st Lt. to Capt.*
Seykota, Harold R., *Capt. to Maj.*
1940 Brown, Percy H., *Capt. to Lt. Col.*

Dr. Compton's V-Mail Christmas Letter to M.I.T. Alumni in Foreign Lands

Dear Friend and Colleague:

On behalf of the Alumni and Staff of the Institute, and on my own behalf, I send you Christmas greetings. In the grim environment of war it seems scarcely appropriate to say "Merry Christmas," yet in so far as possible I hope that even this may be true for you. In any case you are doing a job which far transcends all the conventional activities of the Christmas season, for you are in process of achieving a victory which will preserve to you and all freedom-loving people the right to work in an environment of opportunity, to play with a good conscience, and to live in peace.

I address you as a colleague because the Institute is also engaged in an all-out effort for victory, partly by training Army or Navy specialists and partly by developing devices which will increase your safety or your combat effectiveness.

We are proud of you, we pray that a kind Providence will attend you, and our thoughts are with you in confidence and hope on Christmas day.

* Killed in Action.

† Missing in Action.

‡ Prisoner of War.

* Died in Service.

** Wounded.

Burr, Henry A., *Lt. to Capt.*
Casey, Joseph J., *Lt. to Capt.*
Enos, John E., *Pvt. to T. 5c.*
Schuerch, Conrad, Jr., *A.C. to Lt.*
Witherell, Paul W., *Lt. to Capt.*
McKenney, William A., *Lt. to Capt.*

1941 Shapira, Norman I., *Capt. to Maj.*
Sheridan, Edward W., *Lt. to Capt.*
Sligar, James S., *Capt. to Maj.*
Walkowich, Teddy F., *Lt. to Capt.*

1942 Arnold, George L., *2nd Lt. to Capt.*
Herlihy, Francis B., *1st Lt. to Capt.*
Rosett, Louis K., *Lt. to Capt.*
Strong, William O., Jr., *1st Lt. to Capt.*

1943 Julier, Bertram H., *2nd Lt. to 1st Lt.*
Schultz, Morton L., *Pvt. to 2nd Lt.*

U.S.N.

1917 *O'Brien, Francis F., *Lt. Comdr. to Capt.*
Sherman, Forrest P., *Capt. to Rear Adm.*

1921 Richardson, Lawrence B., *Capt. to Rear Adm.*

1924 Jacobson, Jacob H., *Lt. Comdr. to Capt.*

1924 Stevens, Howard B., *Lt. Comdr. to Comdr.*

1924 Wells, Robert K., *Comdr. to Capt.*

1928 Clay, W. Creighton, *Lt. to Lt. Comdr.*

1929 Hutchinson, Howard B., *Lt. Comdr. to Comdr.*

1932 Minter, Robert O., *Lt. Comdr. to Capt.*

1934 Dobbins, William E., *C.M. 2c to Ens.*

RANK NOT PREVIOUSLY PUBLISHED

1943 Bowen, Russell J., *2nd Lt. U.S.A.*
Crocker, Ernest C., Jr., *2nd Lt. U.S.A.*
Fiore, John M., *Corp. U.S.A.*
Roboff, Stanley B., *2nd Lt. U.S.A.*
Sewell, John M., *2nd Lt. U.S.A.*
Wheeler, John T., *Pvt. U.S.A.*

CASUALTIES

1917 *O'Brien, Thomas F., *Capt. U.S.N.*; died in Japanese Prison Camp.

1923 †Mullinix, Henry M., *Rear Adm. U.S.N.*; *The Liscome Bay*, November 24, 1943.

1927 †McCarthy, Joseph L., *Capt. U.S.A.*; prisoner of war — Japan.

1928 *Estes, Norman C., *Lt. Comdr. U.S.N.*, Pacific Area.

1938 ★ Lamb, Fred L., *Lt. U.S.N.*; killed in Pacific Area, November 8, 1943.

1939 ★ McRoberts, Clare A., *F.O. R.C.A.F.*; killed while returning from mission to Germany, December 11, 1942.

1940 †Goldblith, Samuel A., *Lt. U.S.A.*; prisoner of war, Zentsuyi Camp, Japan.

NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

Technology Club of Chicago

Lonsdale Green '87 sent in the following report of the November meeting: For the first time since last March we had one of our noonday luncheon meetings. It was held on November 17 at the University Club. Our guest speaker was Philip S. Hanna, the financial editor of the *Chicago Sun*. If anyone expected of him a political talk or one expounding the policy of his paper, he was doomed to disappointment. Mr. Hanna was a most interesting speaker, who followed the set pattern of a prelude of anecdote to get his listeners in good humor. From that point on, he covered much ground, talking of high wages, the high cost of living, inflation, and national income. The final lesson he brought home to us was Christianity as exemplified by the Golden Rule. Unless we live by this, the coming peace may be merely a lapse between this and another war. He quoted Lincoln: ". . . this nation, under God . . . a new birth of freedom." He also reminded us that our coinage states: "In God we trust."

Dr. Compton will be guest of honor at our annual banquet the last week in January. — EDMUND G. FARRAND '21, *Secretary*, United Conveyor Corporation, 37 West Van Buren Street, Chicago, Ill.

Technology Club of Hartford

On Friday, November 12, the executive committee held a meeting at the Hartford Y.M.C.A. to make plans for the coming season. Those present were Frederick O.A. Almquist '23, President, Horace B. Tuttle '21, J. P. F. Pilkington '27, Myron F. Burr '32, Arthur F. Peaslee '14, Franklin S. Atwater '38, Ferrari P. Ward '26, Andrew S. LaPenta '22, and Thomas D. Green '26.

Several topics concerning the activities of the Club were discussed, and arrangements were made for the December meeting's program of dinner and bowling. Another executive committee meeting is to be called in the near future. — LOUIS J. PROULX, Jr., '36, *Secretary*, 31 Wells Road, West Hartford, Conn. JOHN A. SWIFT '27, *Assistant Secretary*, Billings and Spencer Company, Corner Park and Laurel Streets, Hartford, Conn.

Technology Club of New York

Applications for membership have been received from the following: Robert L. Sjostrom '20, Lawrence, Mass.; Leland D. Wilson '20, 50 Church Street, New York City; John J. Wilson, Jr., '29, general purchasing agent, Sperry Gyroscope Company, Brooklyn, N. Y.; and Martin H. Winter '43, S.A.M. Laboratories, Columbia University, New York City.

Two out of the three sessions in the bridge tournament have been completed:

Doc Wilson, 62 per cent, and Bill Neuberg, 52.3 per cent, in the first session. The Wires brothers and Doc Duff, 57.4 per cent, and Doc Wilson, 45.8 per cent in the second session, have served notice that they are out for the club championship and the Ranger Trophy.

Our most important news refers to the splendid job that is being done in making over the clubhouse. With a minimum amount of structural alterations, the second floor of the east house will be made into a ladies' lounge and dining room and will be completely refurnished. The main dining room is being redecorated and refurnished, and throughout the clubhouse new furnishings are being added where required. The bedrooms have not been neglected either, as all of them will be completely done over and new furniture installed. This remodeling will go toward making the Club the place to stay overnight when you are in town. — WILLIAM D. NEUBERG '17, *Secretary*, 24 East 39th Street, New York, N.Y. WILLIAM L. KEPPLINGER, Jr., '24, *Publicity Committee*, care of Johns-Manville, 22 East 40th Street, New York, N.Y.

Technology Club of Rhode Island

The Club held its first meeting of the season on November 17 at the Metacomet Golf Club in East Providence. President Freeman W. Fraim '32 presided at the meeting, which was held after an excellent dinner. We were most pleased to have present with us Lieutenant Commander A. Edward Tuttle '17, Lieutenant W. F. Bartlett '29, and Lieutenant M. S. Burroughs '20 from the Newport Naval Torpedo Station, and Major C. H. Lovejoy '10 of the United States Engineer Office in Providence. — DONALD E. WALCH '22, *Secretary*, General Electric Company, 111 Westminster Street, Providence, R.I.

Technology Club of Rochester

Election of officers was the first business before the Club on October 7 at its annual meeting, which was preceded by a dinner at the University Club. The following men were elected: President, Ralph W. Peters '30; First Vice-president, Howard S. Gardner '30; Second Vice-president, Richard M. Wilson '30; Secretary, Frederick J. Kolb, Jr., '38; Treasurer, Richard G. Talpey, '41; Executive Committee: Kenneth J. Mackenzie '28, Robert E. Smith '33, and Harold H. Leary '23. At the completion of the business meeting, Hugh M. Shirey '22, retiring President, introduced Captain Henry R. Couch '20, who is assigned to the Rochester Ordnance District. In so far as censorship permitted, Hank spoke about the functions of ordnance and its part in the war.

Just a few weeks after the October meeting, Ralph Peters had to resign his office, since he had been transferred to Oakridge, Tenn. Howard S. Gardner has taken over the presidential duties, and under his lead-

ership the Club is planning its future meetings. — FREDERICK J. KOLB, Jr., '38, *Secretary*, Building 14, Kodak Park, Rochester, N.Y.

Washington Society of the M.I.T.

Because of Armistice Day, the Society held its November dinner meeting on the 8th, instead of on the second Thursday, at the Y.W.C.A. at 6:15 P.M. In lieu of our scheduled guest speaker, Rear Admiral Howard L. Vickery '21, we heard Marshall E. Dimock, who is assistant deputy administrator for recruitment and manning, War Shipping Administration. Dr. Dimock is a former assistant to the Secretary of Labor and a former professor at the University of Chicago. Our second speaker was Telfair Knight, assistant deputy administrator for training, War Shipping Administration. Both speakers were interesting and informative.

Dr. Dimock said the functions of the War Shipping Administration involved construction work under Admiral Vickery; administration (recruitment and manning); training; man-power utilization plans on all Allied shipping needs; and maintenance of lists of workers in all ports to avoid shipping delays. The W.S.A. has solved the man-power problem by: (1) holding those already employed (chiefly by occupational deferments); (2) bringing back experienced officers to sea; (3) developing rated personnel and officers by training. By arrangement with maritime unions, he uses their lists of available men and then fills deficiencies from his training group. In September, 1942, United States shipping involved 11,000,000 tons and 70,000 men; now it involves 22,000,000 tons and 125,000 men. Shoretim has been reduced to 10 per cent, turnover to 15 per cent, and boat delays from two a day to one a week. Recruitment has concentrated on engineering-department officers and provides repatriation, transportation, stand-by wages, hotels, and rest homes for shock cases. Co-ordination of man power results in the placing of 2,500 men a week.

Mr. Knight described upgrading from seamen to officers, refresher courses, training colleges, and academies. He gave us a broad picture of the development of Diesel, turboelectric, radio, and other maritime schools. Considerable questioning from the audience indicated the interest in the talks.

The following Alumni, whose names are here listed in order of classes, attended the meeting: 1889: G. W. Stone; 1890: J. G. Crane; 1891: James Swan; 1892: B. P. DuBois; 1893: P. H. Thomas; 1896: W. E. Haseltine, M. O. Leighton; 1897: P. L. Dougherty; 1900: F. W. Magdeburg; 1902: A. H. Sawyer; 1903: W. L. Cook; 1904: M. L. Emerson, A. M. Holcombe, F. W. Milliken, G. N. Wheat; 1907: J. P. Alvey, F. W. Amadon, Allen Pope; 1908: P. H. Heimer; 1909: B. A. Robinson; 1911: D. P. Allen, E. R. Hall, C. P. Kerr, W. H. Martin, C. G. Richmond; 1912: R. E. Wilson;

1913: R. A. Lesher; 1915: Allen Abrams, A. D. Beidelman; 1916: J. W. Barker, F. P. Upton; 1918: Joseph Low, H. D. Manuelian; 1919: L. J. Grayson, E. R. Smith, M. P. Smith; 1921: J. A. Mahoney, Richard McKay, F. M. Rowell; 1922: C. F. Blanchard, H. H. Fisk, W. K. MacMahon, C. B. Miller, Jr., J. R. Morton, Jr., E. P. Rowell, R. K. Thulman.

Also, 1923: C. M. Bouis, D. W. Weeks; 1924: J. D. Fitch, P. C. Maynard, R. P. Schreiber, W. W. Sturdy, F. L. Whedon; 1925: C. R. Mabley, Jr., F. W. McGinnis, H. B. Swett; 1926: S. J. Cole, J. Y. Houghton; 1927: E. H. Bramhall, E. G. Cowen, G. C. Popp; 1928: A. E. Beitzell, George D. Mock; 1929: J. A. Plugge, N. P. Stathis; 1930: A. F. Bird, J. R. Bloom, C. W. Maskell, J. A. Mathews, F. W. Turnbull; 1931: J. G. B. Hutchins, E. H. McCoy, F. D. Weeks; 1932: F. M. Moss; 1934: R. B. Jewett, H. L. Woodward, Jr.; 1935: W. H. Brockett; 1936: E. R. Pettebone, 2d; 1937: G. B. Hunter, Jr.; 1938: J. A. Wilson, Jr.; 1940: T. F. Creamer, G. J. Forney, B. F. Greenberg, R. G. Hall, J. E. Thurber; 1941: R. G. Blum, W. M. Compton, Jr., C. H. Corliss, E. L. Rovner, J. S. Sligar; 1942: M. R. Brown, D. H. Stansfield; 1943: A. H. Shairman, Sidney Siegel. Professor R. D. Bennett of the Institute Faculty was also present. — FRANK W. MILLIKEN '04, *Secretary*, 613 North Greenwich Street, Falls Church, Va. WILLIAM K. MACMAHON '22, *Review Secretary*, Rosslyn Gas Company, 3240 Wilson Boulevard, Arlington, Va.

Worcester County Alumni Association of M.I.T.

The Association held its annual dinner meeting at the Hotel Bancroft on November 4. The speaker was Robert G. Caldwell, Dean of Humanities at the Institute. Professor Charles E. Locke '96, Alumni Secretary, was guest of the Worcester club at the meeting.

Dr. Caldwell spoke on "American Links of Defense — North and South." He illustrated his talk by pictures just released by the Department of State. This subject proved to be of utmost interest to all those present.

The nominating committee, which consists of William A. Wilder '98 and John S. Middleton '29, presented its report, and the following officers were chosen for the coming year: President, Orville B. Denison '11, Worcester; Vice-president, William F. Baxter, Jr., '34, Southbridge; Secretary, Arthur J. Lariviere '35, Worcester; Treasurer, Robert N. C. Hessel '27, Worcester; Executive Committee: Andrew B. Sherman '06, Fitchburg; H. O. Berry '22, Gardner; Frederick E. Mader '32, Shrewsbury; Carl H. Wilson '34, Southbridge; and Gordon W. Browne '29, Worcester.

A report of postwar placement was presented by the chairman of the committee, William Wilder. The headquarters of the committee will be at the United States Employment Service, 40 Foster Street, Worcester. All M.I.T. men returning to this area should be referred to Mr. Wilder at the above address. He will give each applicant his personal attention. — ARTHUR J. LARIVIERE '35, *Secretary*, 7 Woodbine Street, Worcester, Mass.

CLASS NOTES

1888

The 114th annual flower show of the Massachusetts Horticultural Society was held in early November at Horticultural Hall, Boston. Edwin S. Webster, President of the society, stated that the show was held in response to insistent public demand. He said: "Flower shows have their place in war as well as in peace. In fact, we need the peace and refreshment of these shows more during these strenuous times than ever before." A feature of the show was the introduction of "chrysanthemum debutante," a new flower that has never before been exhibited in public. A spectator stated that Webster's orchid exhibit, for which he got a silver medal, was the gem of the whole show.

Ernest Silas May passed away at his home, 34 Hancock Avenue, Newton Center, on October 14. He entered Technology with us in 1884. After leaving the Institute, he went into the wool business with Jeremiah Williams and Company, 481 Summer Street, Boston. He had two sons who were graduated from the Institute, Ernest N. May '22 and William E. May '25.

Your Secretary has been highly honored by being inducted into the Old Guard of Princeton, N.J., a society whose membership includes a large number of retired Princeton professors and other residents of Princeton who have retired from active life in various lines of endeavor. The membership includes former professors of the classics, biology, geology, paleontology, chemistry, astronomy, economics, hygiene, medicine, military science, theology, and music. One member is a collector of historical manuscripts, another an international consultant in finance, and still another a former ambassador to Greece under President Woodrow Wilson. This last member is a neighbor of your Secretary on Chebeague Island and is the one who introduced him to the society. The average age of the members is 72 years, the oldest being 87. Meetings are held every week in the magnificent trustees' room, where one of the members regales the rest on the results of his latest research in his particular line. Truly this is a golden opportunity for your Secretary to broaden his education beyond the boundaries of engineering. — BERTRAND R. T. COLLINS, *Secretary*, 39 Wiggins Street, Princeton, N.J. SANFORD E. THOMPSON, *Assistant Secretary*, The Thompson and Lichtner Company, Inc., 620 Newbury Street, Boston 15, Mass.

1890

Having no news in hand, the Secretary decided it was time to start finding out what '90 is doing, so he sent out four letters. He received two replies in time for this issue of The Review.

Morten Carlisle wrote from Cincinnati as follows: ". . . I am in very good health for a man of 74, having all my faculties — teeth, hearing, sight, and so on. I am not in any particular business right now, but I have plenty to keep me occupied. Looking after my real and personal properties is some man-size job these days. I have not gone into any war work. As I have not followed my profession of electrical engi-

neering for quite some years, I have become pretty stale and behind the times. About the only things I could do would be office work or work in a factory, neither of which I would be much good at. My name is on file in Washington, however, for a possibility of some kind, but I suppose my age is against me. I am connected with the local civilian defense corps and turn out for blackouts and so on. I have the usual helmet, whistle, and the five-gallon tank and pump, which I have never had to use. We have a good many Technology men in Cincinnati and vicinity, but they are all younger than I am, as far as I know. We lost our old patriarch, William E. Brotherton '73, about two years ago. Most of the other Technology men of classes previous to 1890 have moved to Florida or California. I have not met anyone from '90 for many years. I sometimes wonder how many of them are still living."

Here is the answer to Carlisle's question: There are 46 living graduates and 37 who are listed as special students, some of whom took only one or two courses at Technology.

From Harold Roberts at Upper Montclair, N.J., came the following: ". . . A man who has and still is bringing up five sons and a daughter is usually on the active list, with but little chance or inclination to retire. As to these youngsters: The oldest lad, Lieutenant Commander Llewellyn B. Roberts, is on the high seas driving a Liberty ship loaded with those things which are so necessary in winning the war. His brother Edwin is a lawyer in New York City, holding down three jobs for those who have been called to the colors. I am enclosing a 'Table of Deflection Angles and Chords' compiled by my son Reon, who is carrying on civil engineering in Bridgeport, Conn., and is at present laying out building lots by breaking up large estates and public properties for the government's housing activities. My fourth son, Lloyd, is in the hospital corps of the Marines as a pharmacist's mate. He had his baptismal bath of fighting the Japs in Guadalcanal at the time the Marines moved in during August, 1942. He now is somewhere in the South Pacific at a main hospital base, taking care of the severely wounded. My two youngest children are still under my roof and are attending high school. Jared has informed me that he is going to join the Navy next April, when he turns 17. So here I am in a 14-room house with the prospect of keeping up the house for three of us, and the rooms chock full of the loveliest memories that a man could wish for. I still keep up my office [Lythic Building Company, New York City] which I visit occasionally. I am hale and hearty, and every time I approach a bureaucratic official he says: 'First rate, just the kind of a man we want.' Then he spots my age and says: 'Nothing doing.' Well, I guess I shall let my children carry on while I endeavor to 'keep the home fires burning.' So, George, that's my 'active work,' living for my children."

The Secretary had an attack of shingles on the head and face last summer. His illness occasioned the following note from Frank White: "I am sorry you had an attack of shingles. At present this disease is believed to be caused by an infection of the posterior roots of the spinal cord and is the counterpart of infantile paralysis,

which is an inflammation of the anterior root. It is probably better to suffer some pain than have paralysis, and, of course, you are not just the right age for infantile paralysis. The first attack of shingles usually protects a person against a recurrence." We should all thank Frank for pointing out this advantage of old age. —GEORGE A. PACKARD, *Secretary*, 50 Congress Street, Boston 9, Mass. HARRY M. GOODWIN, *Assistant Secretary*, Room 4-242, M.I.T., Cambridge 39, Mass.

1892

Your Secretary has been sick since early July. He is at his home at 21 Prospect Street, Taunton, Mass., after spending some time in the hospital. He is not yet able to attend to his duties at the Institute. —CHARLES F. PARK, *Secretary*, Room 5-111, M.I.T., Cambridge 39, Mass.

1894

Recently the Secretary made a tabulation of the location of the surviving members of the Class. From this it appears that our numbers are practically one-half what they were during our student days. We have recent addresses for about 141 men and women of '94. The geographic distribution is interesting. As would be expected, Massachusetts stands first with 44. New York is second with 23, and California third with 16 of our Class as residents. Pennsylvania has 6, New Jersey 5, Connecticut and Illinois 4 each, and Maine, New Hampshire, Virginia, and England 3 each. There are two in the District of Columbia and in each of the states of Ohio, Kentucky, Texas, Delaware, Missouri, and Iowa. There is one classmate in each of the following: Georgia, Florida, Tennessee, Nebraska, Maryland, Rhode Island, Indiana, North Carolina, Wisconsin, Hawaii, the Philippines, Guatemala, and Japan. Our 50th reunion would be an international affair if all could attend.

When we were in New York for a meeting of the American Public Health Association, Horatio Parker and the Secretary took advantage of several opportunities to lunch and to meet for brief conversations. Naturally our talk often drifted to class affairs and inquiries regarding our classmates. Horatio and the Secretary always recall the penniless days when we walked across the then new Harvard Bridge and the sandy desert at the Cambridge end because neither could or would spare the necessary nickel to go by streetcar. Horatio has for years been doing a fine job as head of his division in the department of health of Jacksonville, Fla. — Absence from Cambridge for these meetings deprived the Secretary of a call from E. M. Hunt of Portland, who came to Boston on matters of professional interest. Ned still heads the department of public works in Maine's metropolis. I hope he will call again soon.

A few days before these notes were written, the Secretary had an all too brief call from Arthur Patrick, who was mentioned in the notes last April in connection with his remarkable record as head of the Cleveland Automatic Machine Company, which was awarded the Army and Navy "E." Arthur has now retired from his position as president of the company, but as chairman of the board he retains a long-distance connection with it. When he retired, he

and his wife settled down in a most attractive Cape Cod cottage which they built at Centerville on the Cape, and he is now "living the life of Riley." Gardening, shopwork, reading, and membership in one of the public service groups in Hyannis, either Rotary or Kiwanis, keep him well occupied and happy. It is fine to have him back in the old Bay State.

A recent letter from John Nowell of San Mateo, Calif., expresses the hope that he and his wife may be able to come east for our 50th reunion if transportation difficulties can be overcome. We shall count on them, and on the Austin Sperrys, the Ray Prices, the Anthony Savages, and many others to trek back for the day of days. —Arthur Shurcliff, whom we all remember as our class day poet, sent in a most interesting letter, filled with hopefulness for our reunion and promising something which must, for the time being, remain a secret. As one of the leading landscape architects in the country, he could tell us many interesting things about modern town planning and beautification. Boston and '94 are proud of him.

Jim Kimberly is once more back in his southern home in Tryon, N. C. Jim is still a busy man and presumably keeps his guiding hand on the wheel of the destinies of the Kimberly-Clark Company at Neenah, Wis., although his sons no doubt carry a large share of the administrative load. —Alan Clafin is to represent the 50-year Class at the graduation of the first of the two classes of '94 on February 28. This graduating class will be assured of an interesting address from an old-timer.

John Kittredge has returned to 228 West 72d Street, New York City, after having been located for some time in Trenton, N.J. Arthur LaMotte is still an official of the great E. I. duPont de Nemours organization at Wilmington, Del. His address is 5531 Nemours Building. Not having seen him for more than a half century, we shall hope to greet him in June. —Billy Sayward is now living at 43 Linnaean Street, Cambridge. Billy writes interestingly, but somehow he overlooks the Secretary.

George Taber took exception to the statement in the class notes last June that he had retired. As a matter of fact, he says, he is president of Pennell, Dearborn and Hovey, Inc. He writes: "I have on my shoulders the operation and management of our plant at Lynn, which consists of nine large factory buildings. We rent the buildings to about 45 tenants, many of whom are engaged in war work and some of whom are working two shifts a day. We furnish them with floor space, electric power, light, live steam for processing work, water, heat, and other services for use in manufacturing, and we maintain our own repair and maintenance crew. The company is a close corporation, owned by various members of our family and a few others." —Thanks, George, and profuse apologies. Sometime you may get the Secretary's definition of a man who has retired.

Al Tenney's fine services as class agent on the Alumni Fund have been mentioned previously, but a good story bears repeating. Through Tenney's work, our Class stands No. 4 among all the classes in the percentages of quota of contributors and quota of contributions. Our percentage is

THE TECHNOLOGY REVIEW

104 in each category. A few more contributions might easily put us in the No. 1 position, which would be fine for the 50-year Class. Why not?

Some of us here in Boston will meet shortly to discuss plans for our reunion. Immediately thereafter the long-promised letter thereon will go to every member of the Class for whom we have a recent address. Begin now to plan for the event, which will presumably be in June and probably near Boston, since transportation difficulties make it almost impossible to count on our usual Cape Cod rendezvous. We must not fail to have a good golden anniversary gathering, even if the war clouds have not been dispelled. —SAMUEL C. PRESCOTT, *Secretary*, Room 3-233, M.I.T., Cambridge 39, Mass.

1895

The following interesting news item about one of our "'95 twins," Gerard H. Matthes, is from the *Sunday Post-Herald* of Vicksburg, Miss.: "Gerard H. Matthes, Director of the U.S. Waterways Experiment station, was recently elected to honorary membership in the American Society of Civil Engineers. . . . This comes as a distinct and highly deserved honor to Mr. Matthes who has been prominent in the engineering profession for many years. . . .

"The following biographical sketch briefly gives some of the outstanding accomplishments of Mr. Matthes in engineering work: Gerard Matthes was born in Amsterdam, Holland, March 16, 1874. He received his early education in private schools in Holland and Switzerland and attended high school at Frankfort, Germany. In 1895 he was graduated from . . . Technology with the degree of Bachelor of Science in Civil Engineering. He started work as instrument-man and draftsman for the town of Brookline, Mass. . . . From 1903 to 1905 he had charge of public works in Southern Oklahoma for the U.S. Reclamation Service; from 1907 to 1911 he was connected with the American Waterworks and Guaranty Company, of Pittsburgh, Pa.; during 1914 and 1915 he was in charge of investigation of flood damage and flood control measures on all streams of Pennsylvania; for five years he held the position of hydraulic engineer for the Miami Conservancy District, on flood control of the Miami River.

"In 1920 when the survey of the Tennessee River and Tributaries was first ordered by Congress, Mr. Matthes was appointed assistant engineer. He organized at that time the first large aerial survey undertaken by the War Department. From 1929 to 1932 he was in charge of hydraulic studies relating to water power, flood control, and navigation improvements for the U.S. Engineers Office at Norfolk, Va. In 1932 he was appointed principal engineer in the office of the president, Mississippi River Commission, which position he held to 1942, when he became director of the U.S. Waterways Experiment Station at Vicksburg, Miss. Mr. Matthes is the author of numerous technical articles and reports on surveys, irrigation projects, and flood control. . . ."

In a personal letter to the Secretary, Matthes wrote: "The Mississippi River Commission is taking an active part in the war effort by making many tests for both

1895 *Continued*

the Army and the Navy. Last month's pay roll numbered about 500, and in addition some 1,500 German prisoners of war are laboring on a gigantic model of the Mississippi River watershed, which covers nearly a square mile of land surface. This is the largest experimental model for hydraulic tests ever conceived. It all keeps me fairly humming, and that is what keeps me going."

The Secretary believes that he will hear from the other "twin of '95" shortly. Greetings to both of them. — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass.

1896

Since last month we have made some gain on the Alumni Fund so that as of November 22 we had 92 contributors. This figure is over the top for the quota of numbers, being up to 103 per cent, but the total contributions were \$1,544.50, or only 75 per cent of our quota for amount contributed.

November 16 was a red-letter day for the Secretary in that communications were received from Admiral Bakenhus in New York, from Walter Stearns in Schenectady, from Myron Fuller in Texas, from Harry Baldwin in Swampscott, and from Joe Stickney in Indianapolis. Bakenhus reported on his trip west last summer, which included a visit to Mount Rainier and its glaciers, which were the first he had ever seen and of which he took some excellent photographs that he sent to the Secretary. Mrs. Bakenhus accompanied him on the trip, the main objective of which was the meeting of the board of direction of the American Society of Civil Engineers, which consumed the better part of one week. They had the usual complications that go with railroad travel these days, but fortunately by a brilliant idea of the Admiral for changing trains they were able to make all their engagements as planned. Reuben certainly has mastered the art of fine amateur photography, and he also keeps up a most active pace. He is commander of the Military Order of the World War, vice-president of the American Shore and Beach Preservation Association and chairman of its membership committee, and second vice-president of the Military-Naval Club of New York City. He is already making plans for the annual get-together of the New York members of the Class the latter part of February.

Walter Stearns, who had thought he might locate around St. Petersburg or Fort Myers for the winter, finally decided to go on January 1 to the Charlotte Harbor Hotel at Punta Gorda, where he will gladly welcome any classmates who may be in that part of Florida. Walter also reported that he had received word recently about George Blakeslee, who was a member of Walter's fraternity. George has been running a moving picture theater in Lander, Wyo., but is now seriously ill with heart trouble at the St. Joseph Hospital in Denver, Colo.

The letter from Fuller to the Secretary added to the information published last month. He and Mrs. Fuller get plenty of fish and local beef, although the latter is not too tender, and they can usually get butter. Their particular thrill this year has been two hurricanes, and the description of their experience is so vivid that it is given verbatim. Fuller writes as follows:

"During the first, which did several million dollars worth of damage at Houston, we had only a gentle breeze at Rockport. The second was reported on September 16, with a center advancing at the rate of 15 miles an hour directly toward us from a point only 130 miles away. Fishing launches at once sought shelter up bays and inlets, rowboats were pulled from the water, shutters were put on many stores and houses, some windows were boarded up, war plants at Freeport shut down, and everything movable was brought inside the houses. Then, for two days, we simply waited. The Weather Bureau first reported a slowing down in the rate of advance, but this we did not learn until hours later, and we sat around expecting the wind to strike momentarily. Finally, however, a high-pressure area advanced from the Northwest, pushed in, brought the hurricane to a standstill, and deflected it to Louisiana, the wind velocity at the same time subsiding from 100 miles per hour to a harmless gale. We were the only guests remaining at the Fulton Cottages throughout. Others left, either frankly afraid or suddenly having urgent unexpected calls elsewhere. As one could not tell from the predictions where the hurricane would hit the coast or where it would go inland, one place looked as safe as another to us, so we remained where we were. We have been through three hurricanes anyway, and are more or less used to them. One was at Mauritius in the Indian Ocean, another in the Mariannas on the way to the Philippines, and the other in Massachusetts."

Harry Baldwin is carrying on in Swampscott, and his chief objective at the present time appears to be the buying of the maximum amount of war bonds.

Joe Stickney's contribution was the September issue of *Indac*, the monthly publication of the Indianapolis Athletic Club, of which Joe has been president for some years. This featured the results of a campaign headed by the club which yielded \$493,000 for the purchase of two planes of the Douglas carrier type. The purchase was the result of extra sales of war bonds over and above the commitments the members of the club had made themselves, and the bonds purchased were limited to the savings bond series only. The two planes, designated as *Indac I* and *Indac II*, were appropriately christened at Stout Field in Indianapolis on September 3, with an elaborate parade and fitting ceremony in which the troops of the carrier command at Stout Field stood at attention during the formal presentation and acceptance. Joe and Mrs. Stickney had prominent parts in the exercises, and they stood out particularly well in the pictures of the occasion. The whole publication was a fine product of the printer's art which reflected the splendid job that Joe is doing as president of the Indianapolis Athletic Club.

To carry the story farther, a clipping from the Indianapolis *Star* of November 18 told how the *Indac II*, with its officers and crew, had just returned to Stout Field after a rescue mission in the far North. The story included a complete day-by-day description of how the transport poked its nose 400 miles inside of the Arctic Circle and had landed on the ice to rescue three Hudson Bay employees who had been marooned at Fort Ross for two years.

Admiral Harry Hamlet says that, being in the superannuate class in his profession, he is just plodding along on a retired basis, but apparently he is keeping busy and active in Chevy Chase, Md. Tozier is another man on the retired basis. He reports that he and Mrs. Tozier are both well. They are living very quietly in Rochester, N. Y., waiting for the end of the war to come, at which time they hope to be able to carry out some of the plans that they have made for travel.

Fred Haskell Smith is now located at 836 Yale Drive in Mansfield, Ohio. He bought a place two miles from the center of the town and moved there last April. He has a good-sized lot with shrubbery and flowers, so that he gets considerable exercise. Unfortunately a vegetable garden did not fit into the landscaping, so that he did not do anything in that line last summer. His older son George has been at the Westinghouse plant in Mansfield for 11 years. In civilian production he had supervision of process control of porcelain enamel, but now under war production he is foreman on treatment and fabrication of metal for planes. He has been married for five years and has a son, Gordon Haskell, three years old, thus making the third generation to have the middle name of Haskell, which comes from Fred's paternal grandmother. Smith's younger son Inwood who, like his brother, went to Ohio State University, will be remembered as a leader in football who was chosen in 1935 by Grantland Rice as all-American. He was with the Westinghouse organization in sales promotion in Columbus, Grand Rapids, and Cleveland, until civilian work ceased. In March of last year he went with the Office of Price Administration in Columbus, which was then under state organization, but later when it was changed to a Federal organization he became manager of personnel for district boards. He was married three and a half years ago and has two daughters, two and one-half years of age and four months.

Jacobs at the University of Vermont is engulfed in special teaching work. He wrote early in November that he was keeping perfectly well and working harder than he ever did before, trying to maintain himself a few jumps ahead of his classes in meteorology and allied subjects which he had taken on as extra work outside of his field of geology. He had planned to attend the New England governors' meeting in Boston on November 18 and 19, but at the last minute was taken with a severe cold, so that he went to bed instead.

Lythgoe appeared in print in the August, 1943, issue of the *Bedding Manufacturer*, for which he wrote an article entitled "A Change in the Massachusetts Bedding Law." The December issue of *Scientific Monthly* also contained a highly interesting article by Lythgoe, a member of the staff of the Massachusetts Department of Public Health, on the subject of "Water—the Universal Adulterant."

One of our lady classmates, Mrs. F. W. Lee, has arrived in the grandmother class through the birth of a son on November 16 to her son Francis L. Lee '39. — Dave Beauman was in town from New Bedford on November 12 and called upon the Secretary, who unfortunately was out at the time and missed the pleasure of seeing Dave and getting the latest news from him.

Boston papers carried obituaries on Albert E. Coolidge of Hudson, Mass., who died on November 12 at the age of 94. He was the father of our own William D. Coolidge, and his long life gives promise to the expectation that his son, who is going on with full vigor, will be with us for years to come.

Cornelia Tuttle is at M.I.T. as secretary to Harold E. Edgerton '27, and thus the Secretary has had contacts with her in the distribution of Dr. Edgerton's high-speed movies. She is the daughter of our classmate Mort Tuttle, and the latest item on her is that she was married to Staff Sergeant Eugene L. Klein of St. Louis at Larchmont, N. Y., on November 11. Another pleasure that came to the Secretary was his annual visit to Charles and Bertha Tucker on Mill Road in North Andover, on Sunday, October 31, to partake of a real New England dinner, which started off with a glass of Bertha's famous special tomato juice cocktail. Charlie has had a busy year but reports that he has stood up excellently under the extra work that he has had to do because of the shortage of help. His peach crop this year was nil, and his apple crop was about 30 per cent of last year's, but prices were correspondingly higher because of the shortage, and in the end the net was practically the same as last year, with the prime advantage that Charlie actually had to pick only one-third as many apples from the trees. Classmates will be grieved to learn of the death on June 9 of his son, Charles Mason Tucker '22, which resulted from a heart attack. It was reported in the November issue of *The Review*. The Secretary wonders whether classmates realize the degrees conferred by Technology on the Tucker family. Charlie himself received an S.B. in 1896; his son Charles Mason received an S.B. in 1922 and an S.M. in 1925; his daughter Helen received a Ph.D. in 1933; and his son George Raymond, who died in 1933, received an S.B. in 1925, an S.M. in 1926, and a Ph.D. in 1927. This makes a total of seven degrees conferred by M.I.T. on the father and three children.

It is with great regret that we have to report the passing of another classmate during 1943. Lucius Tyler died on November 1. The funeral services were held on November 4 in the chapel of the Newton Cemetery, and the Class was represented by Jim Driscoll, Myron Pierce, and the Secretary. Flowers were sent in the name of the Class, and a grateful reply came from Mrs. Tyler, who mentioned particularly the great interest and pleasure that Lucius had in his relations with the Class and especially in the reunions. Lucius was always a very active individual, standing out in various activities and especially along musical lines in our student days. Except for a few years when he was in electrical work, he was in business for himself, first in the automobile field for many years. For the last two decades, however, he was engaged in water supply work for suburban places, specializing in hydraulic phases of that work. He leaves a widow; a daughter, Mrs. Mary Josephine Brewer; and a son, John Edwards, '40. Lucius was one of the outstanding leaders in the Class, whose place will not be filled. He had been in failing health for some time, and those who attended the reunion in 1941 will recall that even then he was not his old self.

The Secretaries wish a happy New Year to all. — CHARLES E. LOCKE, *Secretary*, Room 8-109, M.I.T., Cambridge 39, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge 38, Mass.

1898

On November 20, the Secretary attended the closing session of the Babson 30th annual national business conference. This year the program included business, investments, and the war, and was held in the Richard Knight auditorium of the Babson Institute at Wellesley Hills, Mass. When the Secretary arrived at the spacious auditorium a quarter hour before the session was scheduled to start, he found that every seat except the one he took was already occupied. The closing session was devoted to the topic, "How and When Will the War End?" The speakers were Louis J. A. Mercier, Haridas T. Mazumdar, and Toni Sender. Professor Mercier, formerly of France, gave a forecast of probable post-war European conditions. Dr. Mazumdar, of India, who is a friend of Gandhi's, spoke on the outlook in the Pacific. He protested at the way Roger pronounced his name in the introduction. Toni Sender, a former woman member of the Reichstag for 13 years, spoke on "When Will Germany Crack?" All three were fine speakers and gave splendid messages about what they conceived to be the causes which led to the war and how similar causes might possibly be suppressed in the future.

The Babson Institute is an imposing group of buildings on spacious grounds covering a low hill. Many of the buildings are surrounded by woods which form a bird sanctuary, and attractive avenues wind about the hill. On leaving, we drove around these avenues, and we noted that one building was inscribed "Peavey Hall." Roy Peavey, our classmate, was president of the Babson Statistical Organization up to the time of his death. Another building houses an enormous contour map of the United States, which covers the entire ground floor and is viewed from the balcony. The Babson Institute and grounds form a most attractive place to show visitors from other states or countries.

Edgar A. Weimer is a man of decided opinions, which he is free to express, and we must say his opinions are always good. Last August he was asked, on short notice, to prepare an essay for *Sparks*, the paper of the Harrisburg chapter of the Pennsylvania Society of Professional Engineers. The editor's note which preceded the paper will amuse Weimer's classmates: "Upon request Engineer Weimer, our Treasurer, whose experience dates back to the 'Gay Nineties', has submitted the following article on flood control. Needless to state the opinions expressed are those of Mr. Weimer, and were it not for the blue pencil they would have been even more forceful. 'SPARKS' expresses its gratitude to the author." The article itself, which was reprinted in the October number of the *American Engineer*, appears in the "Mail Returns" column of this issue of *The Review*; it ought to be pondered by every legislator as well as by every flood control engineer in the country.

Paul Johnson sent us a two-column book review from the *Pasadena Star-News* of August 21. The author of the book is

THE TECHNOLOGY REVIEW

Charles-Edward A. Winslow and the title is *The Conquest of Epidemic Disease*. The publisher is the Princeton University Press. — George H. Watson can now be addressed at the Vultee Aircraft Corporation, Modification Plant, Tucson, Ariz. William S. B. Dana has moved to 14 Edgewater Road, Grantwood, N.J.

We have received word of the death of William H. Tew on July 5, 1939. Our last information placed him as president and treasurer of the Carpenter-Tew Gear Company of Brooklyn, N.Y. His home was at Westbury, Long Island. He married Eleanor A. Scott in 1905. They had four children.

W. P. Regestein '03 has notified us of the death of our classmate Robert E. Kendall at Hillsdale, N.Y. Bob Kendall was graduated with us in Chemistry. He was a chemist for Procter and Gamble after graduation and later was with the Tidewater Oil Company. In 1918 he joined the Du Pont company at the Haskell, N.J., plant, and a little later he transferred to the Parlin works, where he remained until the Hopewell, Va., plant started making gun cotton in World War I. As superintendent of the plant, he contributed greatly to the progress of that War. Bob resigned after the War because of poor health and had not been active in business since. — ARTHUR A. BLANCHARD, *Secretary*, Room 6-421, M.I.T., Cambridge 39, Mass.

1902

Additional honor has come to Cates through his election to life membership on the M.I.T. Corporation. The Secretary extends his congratulations and those of the Class to Cates on receiving this new honor, in which we share as classmates.

Paul Hansen and your Secretary had lunch together at the October meeting of the American Public Health Association in New York. Walton Sears also attended the meeting, but he could not be rounded up. Hansen's firm has recently opened up a temporary New York office to take care of their eastern contracts. It was good to see him and have a long chat on matters of mutual interest.

A letter was received recently from Patch in Akron, Ohio. Dan is class agent for the Alumni Fund and points out that we are not holding up our end in contributions. It would seem from the record that he is right. Have you sent in your bit? If not, now is the time. — BURTON G. PHILBRICK, *Secretary*, 246 Stuart Street, Boston 16, Mass.

1905

Gene Kriegsman, I, after a longer than usual absence from this column, reports a dual occupation, first, working in the flight strip division of the Public Roads Administration, getting out aviation flight strips for Army Air Forces in various parts of the United States and, second, continuing on his older job of teaching foreman training two nights a week. Gene says: "This is a highly specialized course designed to assist foremen both in the subject of organization and in that of human relations, something that cannot be taught in service. I have turned out 300 students in the last two years. I ran into George Fuller, I, last spring. He was in the central office of the Public Roads Administration for three months, getting special training. I see Damon and O. C. Merrill occasionally.

1905 *Continued*

Lovell Parker gave us an evening at his house during June." — Thanks, Gene. Indirect news is better than none. There must be a selective Washington, D.C., '05 club.

Ed Barrier, V, "has finally reached the top." Ed was elected president of the Arkwright Mutual Fire Insurance Company last May. Looks just the same as when he was climbing the ladder. — The Boston *Globe* of October 23 showed the pictures and announced the engagement of the girl we've heard so much about the past 20 years, Anne Fisher, daughter of the equally famous Andy, X. The lucky man is William Armstrong Hunter, 3d. — Ralph Hadley, I, writes: "I am a laboring man now, drilling holes for 'Rosie the Riveter' or somebody." It's literal. Ralph must be on the night shift, as he came in to pay his respects the other day and found your Secretary too busy (with a five-cent customer) to feel Ralph's biceps. Watch out, you tennis players. Ralph is out of retirement.

E. M. Lines, VI, still with Bird and Son, East Walpole, Mass., announces one new grandson born last March, a granddaughter now almost three, and a daughter in the WAVES. — G. M. Bartlett, V, always on the job at Campbell Soup, reports that his son, Tom, is taking the Army Specialized Training Program course at Syracuse University, where they are "trying to make an engineer out of him." — Hallet R. Robbins, I, has been transferred from the Reconstruction Finance Corporation, for which he had been acting as ore purchasing agent for the past year and a half at Auburn, Calif. He is now with the Foreign Economic Administration in Washington, where he is nonferrous metals analyst in the Office of Economic War Analysis.

Bob McLean has a boy in the Navy (lieutenant, junior grade) who has been in two big naval engagements and is at present "somewhere in the war zone." — Roy Lovejoy, IX, reports keeping his nose to the grindstone, "filling war orders for machine knives for all sorts of purposes," so long that he just had to visit his New Orleans branch for a couple of months "where the lingering summer sunshine spends most of the winter." Roy says their machine knives help make ships, munitions, clothes, shoes, food, and so on.

We learn through the Register of Former Students that Frederick J. Schwarz, VI, died on June 14, 1942. — FRED W. GOLDFTHWAIT, *Secretary*, 274 Franklin Street, Boston 10, Mass. SIDNEY T. STRICKLAND, *Assistant Secretary*, 137 Newbury Street, Boston 16, Mass.

1906

The other three members of the Class who are in the telephone business in Boston — namely, Fred Batchelder, Frank Benham, and Henry Darling — can be reported as on the job and carrying on with their customary efficiency. Reference to Henry Darling, our Class Agent, brings to mind the Alumni Fund. The Secretary was interested to note Fund totals as of September 30. At that time, our Class had subscribed \$1,374 of a quota of \$3,025 — or 45 per cent. Corresponding percentages for the classes for 1904 to 1910 were as follows: 1904, 44 per cent; 1905, 64 per cent; 1907, 82 per cent; 1908, 49 per cent; 1909, 55 per

cent; and 1910, 36 per cent. If I remember correctly, there used to be an Institute tradition particularly prevalent among the members of the odd-numbered classes about our time that they always outranked the even classes. Somehow these figures reminded me of that old saying. I know our Class Agent and all other members of 1906 would be more satisfied if our showing could be improved.

Perusing the 1905 notes in the November Review, I noted that Harry Wentworth had written that he had "accumulated" four grandchildren. Classmates will be interested to know that Frank Benham has now accumulated two, as F. A. Benham, 3d, was born last August. Frank's son, Walter, is in the Coast Artillery and is stationed at an airfield in the Caribbean. On November 13, the Secretary's son, James N., on his way to a combat area as a second lieutenant in the Army Air Forces and navigator of a Liberator, stopped at the field where Walter is located and the boys had a visit of several hours together.

At a meeting of the New England Council in Boston on November 13, the Secretary ran across Malcolm Wight, I, who is one of the executives of the Hartford Fire Insurance Company, Hartford, Conn. Malcolm reported a son in the Navy, who is now studying at Columbia University. — JAMES W. KIDDER, *Secretary*, Room 801, 50 Oliver Street, Boston 10, Mass. EDWARD B. ROWE, *Assistant Secretary*, 11 Cushing Road, Wellesley Hills 82, Mass.

1907

Stuart Godfrey, a brigadier general, who is the air engineer of the Army Air Forces, wrote me on September 28 as follows: "I should like to tell you of the long trip which I have just completed, but there is little time even to mention all of the theaters visited, such as the Middle East, China, and Hawaii, or to enumerate some of the places where I stayed for a bit — a villa in Morocco, a house where Von Arnim had lived in Tunis, Shepheard's in Cairo, a tea garden in Assam, the quarters which the Generalissimo built for our air commander in China, an advanced Air Forces headquarters in New Guinea and another on Guadalcanal. Nor have I time to name the officers and friends I saw (almost all of our theater and Air Forces commanders and engineers), nor to mention the Navy and the Royal Air Force and the Royal Engineers, nor to describe the strange countries and peoples and costumes (or lack of them). My hours have been irregular, planes (all kinds) not always comfortable, temperatures from tropic heat, through Australian winter (mild), to the cold at 20,000 feet over the 'hump.' But it was amazing to be able to go anywhere with scarcely any time lost for weather or other causes, and if I boarded a C-47 at 3:00 A.M. and curled up over a mail pouch, that was O.K. with me, as perhaps I could work in a swim in the Mediterranean the next day with Jimmy Doolittle [24] to even up in the way of exercise and relaxation. Everywhere I found the engineers intensively at work, with full recognition of their unique and vital contribution to the war, both for air and ground forces. So I came back, stimulated to match their effort in furthering our own organizational, supply, and training activities here."

Stuart enclosed a copy of a broadcast he made on the Army Hour radio program on September 26. It is too long to quote in full in these notes, but from it I shall give excerpts. Stuart said: "The rapid construction of overseas airfields has proved an engineering task of first priority. The bulldozer must accompany, or even precede, the airplane in every new theater. . . . England is already a great air base. Yet still more airfields of a permanent character are being built to care for General Eaker's growing air force. . . . In the Far East a tremendous effort is being made to harness the resources of the West to those of the East. Airfields in India have been built by the slow, patient method of mixing concrete by hand and carrying it in baskets to the forms. American engineers and our unequalled heavy equipment are now expediting this process. . . . The difficulty of working in General MacArthur's distant theater, particularly in New Guinea, where there was so little to start with, was enormous, and the achievements of his engineers are impressive. Of particular interest to me was a forward fighter field only 40 miles from the Jap lines, which has been built entirely by one of our new type of air-borne aviation engineer battalions. This location is inaccessible except by air, and by air the battalion was flown in, complete with its light bulldozers, graders, compressors, jeeps, and an extra complement of machine guns for defense. Within three weeks this airfield was ready and served for the successful attacks on Wewak and Lae. General Kenney [11] attributes no little share in the success of his recent operations to the existence of this forward field. . . . Our air-borne engineer battalions, like the well-known steel landing mat, have proved their value in saving priceless time, a factor on which may well hinge the outcome of a campaign."

Albert Fitch Bancroft died at his home in West Newton on November 17. Bert was with our Class from 1903 until 1906 in undergraduate fellowship, and in later years has been an interested classmate, frequently attending class gatherings, and being with us at our 35-year reunion at Oyster Harbors in 1942. You will no doubt remember what a charming "girl" he made as he took principal parts in the Tech Shows of our time. In 1910, Bert became associated with the Thomas G. Plant Shoe Company, and in 1914 he founded the Bancroft Walker Company, manufacturers of high-grade women's shoes. He invented the "Foot Delight" shoe construction, and I have been told in former years by shoemen in Boston that in the opinion of many Bert's ideas and judgment about styles of women's shoes were just about the last word. He continued to be president and treasurer of this firm until his death, and had similar titles in a small corporation known as the Northern Machinery Company. He was a member of several social and business clubs and societies, and had held offices in most of them, including the National Boot and Shoe Manufacturing Association.

About two and a half years ago, Bert underwent a very serious operation, and for a time was in relatively good health, but for nearly a year prior to his death he had been unable to go to his office at his factory in Waltham, except at irregular intervals.

1907 *Continued*

He was married in 1910, and had a daughter, Marjorie (Mrs. Richard P. Dort), who survives him. His first wife died in 1939. He was married again in July, 1942. His widow, Mrs. Marie Lawson Bancroft, resides at 40 Pickwick Road, West Newton, Mass., with Mrs. Dort, whose husband is in the United States service.

Through Frank MacGregor, I have learned that William H. Bradshaw is in charge of nylon tire-cord development for the nylon division of E. I. duPont de Nemours and Company at Wilmington, Del. I told of Bill's previous doings in The Review of November, 1942. The elder of his two daughters is working for the Hercules Powder Company, and the younger daughter is married to Christian Stephen, an aeronautical engineer with the Wright Company. Bill's older son is a chemist in a Du Pont high-explosives plant, and the younger son is in the class of 1944 at Lehigh University. Bill has two grandchildren. His home address is 1900 Riverview Avenue, Wilmington, Del. Frank MacGregor wrote that during the last few days of the week of October 23, he was busy helping his goddaughter get married. This girl was none other than Margaretta Lytle Woodbridge, daughter of Dick Woodbridge of our Class.

Frank wrote: "I was talking with the rector who performed the marriage ceremony, the same one I stood up with at the baptism, and inquired as to my further responsibilities. I found that I am now completely absolved, although some of my friends were trying to tell me that my responsibilities continue through to the grandchildren, if any."

Carl Trauerman kindly sent me a clipping from the Butte, Mont., *Post* of November 12, stating that the highway engineer of Montana had announced the appointment of Roland H. Willcomb, who has been highway department division engineer at Lewistown, Mont., as maintenance engineer for the department, with headquarters at Helena. — Ensign John M. McMillin, Jr., '43, of the Naval Reserve, son of our John, married Dorothy L. Faeder on November 18 in the Church in the Gardens, Forest Hills, Long Island, N.Y. John was best man for his son. The boy was graduated from Dartmouth College in 1941 and thereafter studied in the Course in Business and Engineering Administration at the Institute.

Lloyd R. Fredenall is now a lieutenant general and is in command of the Second Army of the United States, with headquarters at Memphis, Tenn.

Lawrie Allen thoughtfully sent me the following clipping from the October 23 issue of *Business Week*, which will interest you all: "A Dallas, Texas, newspaper reported that the Petroleum Reserves Corporation was getting ready to drill twenty wildcat wells in Iraq and Iran. A Tulsa, Oklahoma, newspaper said that the State Department, which recently gained new authority to set foreign economic policies, had borrowed Colonel John H. Leavell from the Army and appointed him petroleum attaché, a new position, in the Near East." — BRYANT NICHOLS, *Secretary*, 23 Leland Road, Whitinsville, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1908

The first meeting and dinner of the 1943-1944 season was held at the University Club, Boston, on November 16. The following were present: Lang Coffin, Jeff Beede, George Belcher, Sam Hatch, Harold Gurney, Toot Ellis, Steve Lyon, Art Skillings and his son, Art Appleton, Myron Davis, Joe Wattles, Henry Sewell, A. S. Cohen, and Nick Carter.

Bill Booth, Herb Cole, and Cookie, whom we had rather expected, couldn't make it. Linc Mayo is still with the Army Quartermaster Corps and was on a quick trip to the Midwest, so he too couldn't be with us.

After enjoying a fine dinner, we talked over news from various classmates, and then the colored movies which George Freethy took at Oyster Harbors on our 35th reunion last June were shown. George unfortunately had been called to Washington, but he sent his film and projector, which Jeff Beede knew how to operate. The pictures were excellent and certainly brought back the wonderful time we had at the reunion. George also sent a film of colored movies taken by his daughter last winter while she was on a ski trip in the Laurentians. This film was very much appreciated.

After the movies, Joe Wattles ran off some Kodachromes taken at the reunion and also pictures he took on a visit to Lake Mohonk, N.Y., about October 12. The autumn foliage was at its best and, with a background of blue water and rugged cliffs, the pictures were well up to Joe's artistic standards. — Harold Gurney showed some very beautiful Kodachromes he took on a recent trip to Montreal, Ottawa, Quebec, and the Saguenay. The cloud pictures and sunsets were wonderful, and the pictures he took from the top of Mount Royal and up and down the St. Lawrence, for which he used a telescopic lens, were perfection.

Those of us who attended the 35th reunion are much obliged to Harold Gurney for his kindness in sending each of us a copy of the colored picture which Joe Wattles took of the group. Many letters of thanks were written by classmates to Harold, among them notes from Stephen C. Lyon, Harry C. Lord, Langdon Coffin, and George Belcher.

G. C. Lees wrote: ". . . You will recall the commando station at Osterville. I remarked to some of the gang that maybe I ought to go to the station to see what was going on but that I was afraid to do so for fear I would have to go to work. On my return to Pottstown, I found that we were shipping Diesel engine tools to that station, and that week we had a request for and sent an engineer to Osterville and Camp Edwards to straighten them out on certain maintenance difficulties. Camp Edwards sent a jeep to Providence to meet our man and drove him to the Cape via Fall River and New Bedford, and he rode on five types of landing craft. He got back here all thrilled with his experience but sore in body from the rough riding. See what I missed. . . ."

The following letter from George Glover should have been included in the November notes, but it is still good reading. George wrote: "I was . . . very sorry to hear that both Pop Gerrish and Paul Esten have

THE TECHNOLOGY REVIEW

passed away. Rap and I had a swell time at the 35th reunion, and we are looking forward to some kind of a reunion in New York soon. . . . Of course, everybody is so busy that it is hard to make any plans for the future. . . . If Rap and I can line up a definite date, we shall do so. I imagine it will be better to wait until the early part of January. I'll see what Rap has to say. I am sure we shall have a swell meeting in New York City. . . ."

The following gives more news from Mat Porosky in Moline, Ill.: ". . . I am breaking up my home in Brookline for the duration and shall live here at the LeClaire Hotel for the time being. I wish it were possible to tell you more of the things we are doing. . . . You will understand when I tell you that more than 99 per cent of our output carries a rating of AA1 and that it is used by the Army, Navy, and Air Forces. The project of expansion and conversion from peace to the war effort certainly has been a very interesting one. Needless to say, I have enjoyed this work very much, even that in connection with negotiations with the union and the development of a labor contract. The only regret I have is the necessity of leaving home and lifelong friends. I shall get back to Boston four or five days each month to attend directors' meetings, and I do hope I shall have a chance to see you during one of these trips. If there is a class dinner scheduled during the week I am home, I will surely attend.

"You ask what happened to me last June. You will remember I introduced you to my son Stanley, who was graduated with the Class of 1943 in Course XV. He was then assigned to officer candidate school at Camp Davis, N.C., and on June 3 was commissioned a second lieutenant. He then came home for a few days' leave. We had not seen him from early February until June, and consequently we spent with him the few days that were available. This, and also the fact that right at that time we were starting production on a new and important secret contract with the Navy, prevented me from taking the time off to go to the Cape with the Class. I certainly did regret it. You will be interested that my son has now been ordered to report to one of the Army schools for further training as a specialist, notwithstanding his desire to go overseas with his antiaircraft unit."

Waldo Davis' son was married in September. The New York *Herald Tribune* of Sunday, September 19, carried the following item: "Miss Katharine Magee, daughter of Mr. and Mrs. Sanford J. Magee, of Hampton Roads, Scarsdale, was married . . . to Ensign Waldo F. Davis, Jr., U.S.N.R., son of Mr. and Mrs. Davis of Malden, Mass. . . . Mrs. Davis, Jr., attended St. Margaret's School, Waterbury, Conn., and will be graduated next June from Smith College. Ensign Davis was graduated from Massachusetts Institute of Technology this year."

The Boston *Traveler* in September carried an excellent picture of Hobie Ferris' son, with the caption: ". . . When E. M. Ferris of Boston was rejected by the U.S. Navy and about to be drafted into the Army, he volunteered for the British Navy. Now, as Lt. Ferris, R.N.V.R., he has Atlantic convoy duty and action against a submarine to his credit — not to mention a wife, who is an officer in the W.R.N.S."

1908 *Continued*

The War Production Board's pulp production office has announced the appointment of C. O. Brown of the Southern Kraft Corporation as regional aide for the South Central States, with headquarters at New Orleans, La.

We are sorry to report the death of Hap Ellis on November 5. The following obituary appeared in the New York *Journal of Commerce*: "Alexander Ellis of the Boston firm of Fairfield & Ellis died . . . at his home in Belmont, Mass., of a heart attack. He was . . . apparently in good health.

"Mr. Ellis was born in Cambridge, Mass., in 1887 and was educated at the Massachusetts Institute of Technology. On leaving Tech, he became associated with the Underwriters' Bureau of New England as an inspector, remaining with the bureau two years. He then became associated with Russell & Fairfield where he remained until 1913. He then joined Field & Cowles agency as head of their engineering department. He went overseas in the first World War as a member of the 101st Engineers. He was detailed in charge of fire protection for munitions dumps and storehouses of the American Expeditionary Forces, organizing the entire system including the installation of sprinkler systems and other fire protection appliances, with the result that there were no serious fires in these concentrations. He returned to this country with the recommendation for a captaincy, which he received.

"In 1918 he joined with Stephen E. Barton under the firm name of Barton & Ellis. The firm was consolidated in 1925 with Russell & Fairfield and has since continued as Fairfield & Ellis. Mr. Ellis has served as president of the Insurance Society of Massachusetts and of the Insurance Federation of Massachusetts. His knowledge of big risk underwriting and his familiarity with laws, forms and contracts governing the placing of large line insurance both in the United States and Canada made him an authority on these subjects. He leaves a widow, one son, Alexander, Jr., in the service, and two daughters, Jean and Shirley."

Cookie, our Class Agent on the Alumni Fund, reports progress but says that both '07 and '09 are doing better than '08. That situation doesn't seem right. Any who have neglected to contribute to date ought to help our record by making a contribution. — The second get-together meeting and dinner of the 1943-1944 season will be held at the University Club, Trinity Place, Boston, on Tuesday, January 11, at 6:30 p.m. The usual notice will be mailed early this month. Please make your plans now to come. — H. LESTON CARTER, *Secretary*, 60 Batterymarch, Boston 10, Mass.

1909

Paul rounded up a number of the New York men for their first luncheon of the season on Saturday, November 20. As usual it was held at the Technology Club at 24 East 39th Street. The Review Secretary happened to be in the city that day and was more than pleased to be invited. The following were present: Hardy Cook, VI, Chauncey Crawford, I, Chet Dawes, VI, Benny Dow, II, Dale Ellis, XIV, George Gray, VI, Let King, IV, Mex Weill, II, and Paul Wiswall, V. The following classmates were unable to come and sent regrets:

Phil Chase, VI, Jim Critchett, XIV, Tom Desmond, I (who was attending the Brown-West Point game); Carl Gram, X; Ed Howe, VI (who was in Boston); Delos Haynes, VI; B. Edwin Hutchinson, III, of Detroit (who wrote, "War is hell and New York a long way off"); Lewis Johnson, VI; Reg Jones, VI (who was away from New York on business); Bob Latimer, II; Andrew Matte, VI; Chet Pope, X; George Southgate, VI; and Harry Trevithick, V. Needless to say, old times were hashed over and the spirit of good-fellowship prevailed.

Hardy, one of the few who still has all his hair and no gray ones at that, was wearing a three-star service pin. Hardy, Jr., is a technician, third grade, doing specialist training at Ohio State University; Walter Hastings is now a captain in the Ordnance Tank-Automotive Center at Detroit; and Margery has just been graduated as pharmacist's mate, first class, and is on duty at the Naval Hospital in Chelsea, Mass.

Chauncey Crawford is one of the cogs, and an important one we surmise, in the engineering firm of J. G. White and Company. — Benny Dow is in the works manager's office of the American Cyanamid Company, Calco Chemical Division, at Bound Brook, N.J. — Dale, with Ken Davidson '19, is still doing research work on seaplanes in tanks at Stevens Institute of Technology. A new building, housing a very large tank, is about to be erected. — George Gray is still transmission engineer for the International Telephone and Telegraph Company; Jack '40 is at the Newark plant of the same company. — A little while ago Let King was putting up buildings to surround equipment in chemical plants. He is still putting up buildings but buildings for the manufacture of magnesium to be used in airplanes. — Mex made the trip over from Port Jervis, where he is president of Skydyne, Inc., a plywood products company. He told of many amazing developments, such as control surface structures for airplanes stronger and lighter than magnesium; of being able to cut the weight of airplane parts 10 per cent and yet have them stronger than before. He predicts a great future for the industry. His son Bob, who is 29, is his right-hand man. — Paul, besides supervising '09 affairs, is continuing the translation of St. Luke from the original Greek.

Tom is as active as ever in behalf of the public welfare. In a letter to the New York *Sun* on October 28, he called attention to the need in New York for judicial reform and described the three bills that he planned to introduce in the legislature. He is also considering proposals whereby the state supreme court judges are to be appointed by the governor, and certain judges and magistrates of lower courts in New York City are to be appointed by the mayor. The November 9 number of *Pic* carried a comprehensive illustrated article, "Black Market in Poultry," of which Tom was the author.

Harry Trevithick, who is with the bureau of chemistry of the New York Produce Exchange, has been elected president of the Association of Consulting Chemists and Chemical Engineers. — Brad Dewey, the new rubber czar, took a little time from his important duties in Washington to act as principal speaker at the opening in Cambridge of the Greater Boston United War

Fund at the Hotel Continental on Friday evening, November 5. Brad supplied the initial impetus that kept the drive going strongly to the end.

We were more than pleased to hear from Jack Moses, VI. As may be recalled, he held many student honors, being class vice-president in his freshman year, class president in his sophomore year, a member of the freshman relay team, and a fleet halfback on the sophomore football team. He was also on the varsity relay team, was a member of the Institute Committee, was manager of the fencing team, and so on. Jack wrote from Detroit on a Cronenweth and Moses letterhead, for the information of the Secretary, but gave permission to use the material if the boys might be interested in it, which, of course, they are.

"From the time I was graduated until very recently," he wrote, "we were manufacturers' representatives and did business under the name of the A. L. Moses Company, which was not a stock company but simply a licensed company. During that time two or three of us built a plant in Chicago and ran it for 20 years. It was known as the Great Lakes Forge Company. The A. L. Moses Company was sales representative for the Great Lakes Forge Company. . . . We arrived at a point where we were working about 500 men, but in April, 1940, we sold the Great Lakes Forge Company to the American Brake Shoe and Foundry Company, with which you are no doubt familiar. At that time I closed the A. L. Moses Company and took a position with the American Brake Shoe company, being made vice-president. Not satisfied with the way and methods of a large corporation, I resigned in April of 1943 and again started in business as a manufacturer's representative, this time with H. E. Cronenweth.

"My oldest boy, John Philip, who is now 26 years old, is in the Pacific with the meteorological department of the Air Forces. When he left, he had the rating of corporal. We hear from him occasionally, but we have nothing but an A.P.O. address for him. Donald, my second boy, is now in training with the ski troopers at Camp Hale in Colorado. He has had one furlough, and of course we were very glad to see him." — PAUL M. WISWALL, *Secretary*, 90 Hillside Avenue, Glen Ridge, N.J. CHESTER L. DAWES, *Review Secretary*, Pierce Hall, Harvard University, Cambridge 38, Mass. Assistant Secretaries: MAURICE R. SCHARFF, 3860 Rodman Street, N.W., Washington 16, D.C.; GEORGE E. WALLIS, 1606 Hinman Avenue, Evanston, Ill.

1910

Your Secretary has been delinquent in not having exerted himself in procuring news of classmates for The Review. He has, however, found it extremely difficult to obtain information of classmates, as he has been stationed in Portland, Maine, as area engineer for the past year. Although the duties of this job were not spectacular, they were extremely interesting, and were varied enough to keep him very busy. Now he has been transferred back to Boston as procurement officer of military supplies for the New England division. With this change perhaps he may be able to have some news of the Class in every issue of The Review.

1910 *Continued*

The following letter was received from Carroll Shaw last July: "In April, 1942, I went to the plant of Basic Magnesium, Inc., near Las Vegas, Nev., as electrical consultant for Coverdale and Colpitts, who took over the supervision of design and construction for several months for the Defense Plant Corporation until the Anaconda Copper people bought the controlling interest. I enjoyed living on the desert, even though the temperature exceeds 115 almost every day during July and August. The desert coolers with which all living and working quarters are equipped make life bearable. The humidity runs about 3 per cent when the weather is hottest. Since Nevada has no inhibitions as to gambling and other forms of moral relaxation, I was kept very busy catching up on my wild oats. My family was with me part of the time, and we had an opportunity to visit many interesting places near by, such as Boulder Dam, Eldorado Gulch, Charleston Park, Valley of Fire, Bryce Canyon, and Zion Canyon. We visited Death Valley in July — which is not recommended — and called on Death Valley Scotty.

"In January, 1943, I was appointed chief business consultant for the aluminum and magnesium division of the War Production Board and made inspections of the light-metal plants in Oregon, Washington, Michigan, and Tennessee to study the possibility of establishing central pools of spare electrical equipment. I met Technology men at many of these plants and could not help being impressed with the way M.I.T. puts its men at the top. I completed this work in June.

"Our son Alan, Harvard '44, has been classified for navigator training in the Army Air Forces and is now awaiting assignment to a training center."

The New York *Journal of Commerce* gave the following news of Stuart Sneddon: "The appointment of J. Stuart Sneddon as vice president in charge of sales for the H. K. Ferguson Co., industrial engineers and builders of Cleveland and New York, effective May 1, was announced by Harold K. Ferguson, president. Mr. Sneddon has been in charge of construction for the organization during the past year. . . . A graduate of Massachusetts Institute of Technology, Mr. Sneddon is well known in the industrial field. Prior to joining the Ferguson Co., he was vice president of American Type Founders, Inc."

Some months ago, news concerning Paul Hopkins, who was president of the Shanghai Power Company, was given in this column. We have now learned that he is interned in Haiphong Road, Shanghai, by the Japanese. His father has recently returned to Massachusetts.

I am sure all classmates extend sympathy to Harold Perry, whose son, Sergeant Harold Perry, was killed in action on a bombing raid over Europe on May 29. — Dan Gibbs has announced the marriage of his daughter, Emily, to Harry Begian, United States Army. — HERBERT S. CLEVERDON, *Secretary*, 117 Grant Avenue, Newton Center 59, Mass.

1911

When the November 1 standings by classes in Alumni Fund IV appeared, the three top classes in number of subscribers were 1885 with 118 per cent, 1891 with 113

per cent, and — you guessed it! — 1911 with 106 per cent. We had subscribed 92 per cent of our \$2,940 assigned quota, the best class percentage since the Class of 1894. You and you and you made this fine record possible, and a happy and proud Class Agent you make me!

Caleb S. Bragg, II, died at his home, 277 Park Avenue, New York City, on October 24, at the age of 57. A graduate of Yale in 1908, he spent a couple of years with us in special postgraduate work in mechanical engineering. Adventurous in character, he started a career as an amateur racing driver in 1910, and in 1912 won the Grand Prix of the Automobile Club of America. Associating himself with Glenn L. Martin in California in 1915, Bragg became an aeronautical enthusiast and during the first World War was a captain in the Army Air Corps, directing flying at McCook Field, Dayton, Ohio, and also supervising all tests of airplanes, engines, accessories, and instruments for the Army there. In September, 1919, Bragg established two world's altitude records — 19,100 feet for a hydroplane with a passenger and 21,000 feet for a seaplane without a passenger. Later that year he resigned his Army commission and organized the Bragg-Kleisbrath Corporation for the design and manufacture of a vacuum-operated brake for automobiles and other vehicles, heading this company until it was acquired by the Bendix Aviation Corporation in 1930. Bragg retired from business in 1931 but returned in 1935 as vice-president of the Bendix Marine Products Corporation. He was also a director of the Wright Aeronautical Corporation.

Our congratulations to Marc Grossmann, III, recently elected President of the American Society for Metals. Thanks to Paul Cushman, VI, executive of the McGill Manufacturing Company, Valparaiso, Ind., I received a copy of the 1943 preconvention issue of the society's *Review*, containing an excellent picture of our Aurora Borealis as well as one of Alf deForest, XIII, who presided at the opening night's group meeting devoted to nondestructive tests on metals. Later Paul thoughtfully sent me the graphic section of the November 14 edition of the Chicago Sunday *Tribune* with a feature story titled "Kenney of the Fifth!" It was a profusely illustrated story written somewhere in New Guinea just before the Fifth Air Force's spectacular attack on Rabaul and ties around a statement by our George: "Attack! When in doubt, attack! We figure on attack and whenever we're in doubt we ALWAYS attack. . . . Defend with an air force and you're caught on the ground. My reserves are the planes that get back!" If you can get hold of a copy, do so — it is well worth while.

Having heard that Henry W. van Hovenberg, XI, has returned to active duty as a lieutenant colonel, I now find that my records show 21 classmates in the service at present. Congratulations to Bob Schurig, VI, upped from major to lieutenant colonel.

I had a nice letter recently from Ted van Tassel, X, who is a major in the Chemical Warfare Service, now located at Huntsville Arsenal, Ala.: "I left Chicopee Falls on April 28," he writes, "becoming administrative officer at the Firestone company in Fall River until August 25, when I was transferred to Camp Sibert, Ala. There I

THE TECHNOLOGY REVIEW

served on staff as supply officer for the officer battalion until October 11, when I was transferred here. I am now in the procurement and production control division. This is a large arsenal, nearly the size of the District of Columbia, with fine group of officers. Several who have visited here from the Office of the Chief of the Chemical Warfare Service have been M.I.T. men."

Carl Ell, XI, President of Northeastern University, in his charge to the mid-November graduates, of whom there were 154, declared they were not at present free to do as they pleased; rather they must do what aided the nation in these serious times. He added that this regimentation would cease once the war had ended.

Kingsley W. Dennett, II, may now be reached at 2947 Manoa Road, Honolulu, T.H.; and Charles A. Magoon, VII, at 4308 Queensbury Road, Riverdale, Md. — A happy and prosperous New Year to you all! — ORVILLE B. DENISON, *Secretary*, 82 Elm Street, Worcester 2, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford 55, Mass.

1914

Less than six months to our 30th reunion! As has been indicated in these notes, we plan to hold a reunion. It will be an unpretentious affair and will be held at some place relatively easy for a considerable number of the Class to reach. Buck Dorrane, Charlie Fiske, and your Secretary met in New York in December to get formal plans under way. Speaking of Buck, did any of you see his picture as one of a small group of members of the National Association of Manufacturers attending a public relations conference?

In response to your Secretary's request in these notes for information regarding sons of '14 men now in the service, Frank Ahern has written that his son, who was a senior at the University of Maryland, has joined up with the V-7 Navy program and is now at Cornell for about four months, after which he expects an assignment to a midshipmen's school.

Dean Fales continues to make the front pages in automotive journals and the automotive sections of the press. The latest item which has been called to your Secretary's attention is a picture of Dean sitting in an open car not much larger than Dean himself. The title of the picture reads: "The winter of rideless Sundays let me rebuild a 1908 de Dion from a junkyard wreck to a snappy little rig that will be my official car for Veteran Car Meets after the war. It will do a snappy 35 mph and has fine vision and ventilation."

The November 10 issue of *Chemical and Engineering News* carried a feature article on the subject of "The Field of Synthetic Rubber vs. Natural Rubber and the Plastics." The author is our own Ray Dinsmore. This is one of the most straightforward, authoritative articles that have appeared on the subject. Describing Ray, the editors wrote: "Ray P. Dinsmore, vice president in charge of research and development, graduated in chemical engineering in 1914 from M.I.T., and entered the experimental department at Goodyear Tire & Rubber Co. on technical service and compounding. He went to Bowmanville, Canada, in 1916 as compounder, became assistant chief chemist at New Toronto in 1917, chief chemist at

1914 Continued

California with the opening of the Los Angeles plant and returned to Akron in 1921 as assistant development manager and chief chemist. In 1932 he was assigned to the development of new produce as assistant to the factory manager, directed the research that resulted in Pliofilm and other products, was made development manager in 1939 and vice president in June 1943. As assistant deputy rubber director, from October 1942 to May 1943, he organized and directed for the Government the research and development work on synthetic rubber, coordinating activities of industry and university laboratories. He has written many technical and engineering papers, was given an honorary degree of doctor of engineering in 1940 by Case School of Applied Science in Cleveland."

Happy New Year! We hope you have made two good resolutions: (1) to put the 1914 quota for the Alumni Fund across before our 30th reunion, and (2) to attend the reunion. — H. B. RICHMOND, *Secretary, General Radio Company, 30 State Street, Cambridge 39, Mass.* CHARLES P. FISKE, *Assistant Secretary, 1775 Broadway, New York 19, N.Y.*

1915

New Year's greetings to all my classmates. — As of November 30, our Alumni Fund score was as follows: 145 contributors, who have given \$2,431.50 for almost 84 per cent of our quota. A \$17 average is hitting a new high. Only 10 men who gave last year have yet to give this year. This is a proud record, but let's have those last few stragglers from last year so we can hit our quota 100 per cent. My sincere thanks to those who have given.

It is most pleasing and gratifying to the Secretary to have had so many complimentary remarks from classmates and members of their families on the notes in the November Review. But remember that the only way we can keep up this interest is to have material from you fellows to make our column worth while. Frankly, I am running out of letters that have come in with Alumni Fund checks, so from here on I must depend on you chaps for news about yourselves. Don't be afraid to see your names in print. There are lots of your old friends who would like to read where you are, what you are doing, and something about your family. Loyal Alumni Fund contributors and letter writers have supplied the newsy letters which follow.

Ray Stringfield, 229 South Normandie Avenue, Los Angeles, wrote: "My youngest daughter is just 18, and there goes my last income tax deduction for dependents. The other daughter is a junior at the University of Southern California and was a counselor at the scout camp at California State Redwood Park. My son Bob came home on leave after spending 17 months with his ship around Guadalcanal and the Coral Sea. He was wearing six battle stars, of which we are naturally proud. . . . I am holding down the job of staff process engineer for the Consolidated Vultee Aircraft Corporation at Vultee Field, Calif. The aircraft industry is still very new and bubbling, and thinks that chemists and chemical engineers are a kind of poison, so we call ourselves process engineers and kid people into thinking we are useful. Anyhow, it's all very complicated, and the funny

thing is that Ken Kahn is doing practically the same thing at Lockheed Aircraft. We'll get this aircraft industry trained yet. . . . I can't get away from my hot-air habits. I gave the Faraday Lecture at Pasadena Junior College a month ago, and since then have talked to the California State Chamber of Commerce and to a couple of Kiwanis clubs on 'Materials for Today.' All you have to do to interest people these days is to wave a plastic ammunition roller in the air or show a piece of Buna S and tell them that maybe they'll have some tires next year. . . . I saw John Gallagher at the national meeting of the American Society of Mechanical Engineers here. He's still with the Texas Company and is looking big and prosperous. He gave me a guest card, so I didn't have to put the registration fee on my expense account."

The following letter from Loring Hayward was written longhand. (How's that for interest?) I know you'll agree with me that it is entertaining. Loring wrote: "Here I am, plugging away with Professor Barrows' book on dams in front of me, designing a dam 80,000 feet high, to hold a reservoir of 248,000,000 quarts, and I interrupt my work long enough to go see how many checks the mailman brought in, and what do I find? Two envelopes, one from friend Tom Hassett, collector of internal revenue for Massachusetts, reminding me of that unpaid balance, and another containing a second notice that I have not made a payment to the Alumni Fund, with a note on the bottom saying, 'Don't let me down, Azel.' What a shock! All the years I have been laboring under the delusion that my pennies went to support the Institute, not a smug bachelor who is unwilling to assume the responsibilities of raising a family. . . . A year ago I started work in a bramble patch in Taunton, from which finally emerged Camp Myles Standish. I blush to reveal my title, but it was along Course XI lines. . . .

"Our family became very much involved in the war effort. My wife ran the office in addition to her household tasks. My oldest son Loring, a lieutenant in the Navy, was in active service in the Pacific area before and including Pearl Harbor; son Richard is a first lieutenant in the Air Forces; daughter Barbara is working at the camp as blueprint operator; and young son, Robert, is living a life of neglect because of the activities of his elders. I have filled out many application blanks, but both the Army and the Navy have been blind to the sterling character they so blithely reject. One kindly squirt wrote: ' . . . hopes that you will be able to participate in one of the many civilian defense activities.' Of course such a paragraph might be understandable for some of the dissipated members of the Class, but for a man of splendid physique and rugged health it is comparable to a kick in the back of the underwear. Well, the bramble patch, somehow or other, between the first of June and the first of October, 1942, was ready to take troops, and work was completed on January 31, 1943. I returned to my office in March to resume Course I where I left off."

Frank Scully, running for councilor in Cambridge under Plan E, was unfortunately defeated. But he received a glowing write-up in the newspapers, and I'll quote it for you in a future issue. —One of the commenta-

tors on our December notes was Barbara Thomas, who said: "What is that 200-proof stuff, anyway? Sounds good to me. Charlie Williams must see quite a menagerie at times. Classes were carried on as usual at Technology on Thanksgiving Day, so I had to work, but I was glad to contribute this little bit to help end the war."

Another one of our classmates is doing his bit in uniform. See how Bill Brackett makes my job hard! But it's all right with me as long as he sent his check. He wrote: "I guess I have seen enough of your methods, so I am enclosing my check. I wanted to see how much work you would do to get it, and how you would go about it. You did a good job. You may be interested to know I have been in the Coast Guard Temporary Reserve for a couple of years. We used our own boats for the patrolling. Now Uncle Sam has given us Coast Guard Reserve boats to use. I gave two days a week and then became commander of our flotilla. In that capacity, I had to give seven days a week, so after several months I resigned and am now on a one-day basis. . . . I was pleased to see George Rooney at the Engineers Club outing at Woodland recently and was glad to learn that he is back in Boston, to his satisfaction. My son quit M.I.T. and is in the Navy, but they are keeping him in the radio engineering schools, which is to my liking, but not so much to his. You probably forgot, but you and some of the boys were to let me know when I might expect you at my home for beer and pretzels. See if you can make it sometime." — We'll try to arrange to accept Bill's invitation for some of the Boston gang.

Even our classmates' wives are loyal to 1915. Mrs. Hope Holway wrote the following splendid letter for Bill, who is a consulting engineer and lives at 302 East 18th Street, Tulsa, Okla.: "I am going to write you a note about Bill, for I know he just won't get to it and I think it is time that you had something from him. He is still consulting engineer for the western power division of the Federal Works Agency on the Pensacola Dam and the surrounding project. We have about finished the work. Remaining are some equipment in the substations and some channel work below the dam. Our recent 100-year flood scoured out the spillway channel so thoroughly that final riprapping and control dikes can now be built. The war has lengthened our program here and extended it; the plant is running full capacity and furnishing power to various war industries in Oklahoma and Arkansas. Bill has also completed the design of the High Point hydroelectric project on the Yadkin River in North Carolina. Construction will probably not start before the close of the war. We still have a force there completing land surveys.

"Our field force here in Oklahoma is concerned now with the five-foot raise of the reservoir, which meant a whole resurvey of the lake shore and some railroad and highway construction. This latter work is being carried out under a new contract with 'W. R. Holway and Associates,' which is our family partnership, formed two years ago. It is made up of Bill and me and our two sons, Don ['42] and Bill ['43]. Don is an electrical engineer and has done much of the design and supervision work on the power house and substations for this proj-

1915 Continued

ect and the electrical design for the High Point job. He is now working on the plans for the fifth unit in the power house here while he is waiting for the last equipment to arrive for the substations. Don was graduated from the University of Chicago in physics and had almost completed his graduate work in Electrical Engineering at M.I.T. when we had to have him on the work here. His son, Donald Field Holway, born two months ago, is our first grandchild and of course is a wonder. Bill, Jr., was graduated from M.I.T. in February and had already enlisted in the Navy. He had his indoctrination at Tucson and now is studying naval architecture at the University of Michigan. His rank is ensign. Our daughter's husband is in the Radiation Laboratory at M.I.T. as one of their physicists. All of our children were married within one year, and we are very happy with our new children.

"We still have our headquarters in Tulsa, but we live most of the time in what is left of our engineers' camp on the shores of the lake which we built. Bill is also greatly interested in a ranch which he has started farther up the lake, and his pigs, steers, orchard, and sweet potatoes are as important to him now as his dams and transmission lines. He expects to contribute in a considerable measure to the solving of the winter food problem. We have a fine milk cow and a flock of good laying hens at the camp, too, so we do not worry as much about ration points as we used to."

Supplementing his first letter telling of Ed Schoeppe's death on October 18, Henry Daley wrote from Philadelphia: ". . . Ed had maintained his own architect's office in Philadelphia for the past 25 years until recently when he joined the staff of Sharp and Dohme in Glen Olden, near Philadelphia. He was quite happy in his new position and told me at our last meeting of his contacts with Peter Masucci, who is associated with the same company. Ed and I had lived in Elkins Park for the past 20 years and were members of the same American Legion post, he having been a first lieutenant in the Air Service in World War I. He is survived by his wife, Gertrude, and two daughters: Mary, a freshman at Wilson College, and Carol, a senior at Cheltenham High School, Elkins Park."

Remember, help Azel with some letters for the class notes — or else! — AZEL W. MACK, *Secretary*, 40 St. Paul Street, Brookline 46, Mass.

1916

Henry Shepard, a lieutenant commander, comes to our rescue, enabling us to maintain our record of not missing an issue of The Review with some interesting class notes. For some reason or other, Henry felt called upon to write the following communication, which is somewhat cut from the original version: "As Ordnance officer on the base, I live in special quarters with four other officers. These quarters are assigned to me and I can invite such other officers in to live with me as I may see fit. . . . The house is a one-story affair with a large screened-in porch on three sides. The bedrooms have latticework walls on two sides, opening onto the screened porch, so that there is always a good free passage of air. Cooking is done with an electric stove. We have spacious grounds outside the

house, with grapefruit and lime trees, and several trees that are in more or less constant bloom with white and red flowers. In front, we have a number of rosebushes which are in constant bloom. In back, we have a large vegetable garden, where we grow our own tomatoes, lettuce, carrots, beets, okra, string beans, shell beans, and so on (right now we are enjoying our own asparagus). Behind the garden we have a large chicken yard where we have about 15 hens and are able to have fresh eggs for breakfast. To keep our establishment clean and in running order, we have one Chinese cook, named Hang; a Chinese gardener, named Yu Yow; and a house cleanup man, named Chang Nam.

"We get up a little after seven and, before we are fully dressed, go out into the kitchen and give our breakfast order to Hang, so that he will have everything on the table when we are ready to eat. Fresh oranges are rather scarce; hence we usually have canned fruit juice. Thus far, our breakfast menu always has included bacon. Because there are no cows in this section of the country, we get our milk from a mechanical cow. No, I don't mean canned milk, I mean a mechanical cow where powdered milk, butter, and fresh water are mixed together mechanically. The result tastes somewhat different from fresh milk at home. However, it is much better than the canned variety. These mechanical units are now being made in a small size so that on board a destroyer the men can get this fresh mechanical milk.

"Breakfast over, we get to our work at eight o'clock in the morning and continue until noon. Lunch is from twelve until one and then we work from 1:00 to 5:00 P.M. As Ordnance officer, I have a large private office, next to which is another office where I have a chief civilian clerk and one yeoman. . . . Moving around as I do in my work gives me plenty of exercise, but I go out and play golf several times a week, late in the afternoon. We have a very good nine-hole course here. When I leave the office at 4:30, I can usually get in five or six holes before dinner.

"After dinner, one can go to the movies, which are held at an open-air lyceum where it is always cool in the evening, even during the summer months. There is a new program each night. As you can well imagine, some of the films are rather old in order to keep up this change of schedule each night. However, since I never went to the movies in the States, they are all new to me. If one doesn't care to go to the movies, there is a very good library with all of the latest periodicals and recent books which are sent here from the States. About once a month, the United Service Organizations have a show here which is always very well received as it gives the boys a chance to see what the female of the species looks like. The only women who are allowed here on the base are the eight nurses attached to the hospital.

"Sunday office hours are from 8:00 to 1:00 P.M. There usually isn't very much going on at the office on Sunday, so I slide out and go to church, which lasts about an hour. The church, like everything else here on the base, is very new and quite attractive. It has a good electric organ and the minister is a two-fisted fighter if there ever was one.

THE TECHNOLOGY REVIEW

"Once each week I take my turn in being the station duty officer. As such, I am second in command to the commanding officer here at the naval station. . . . Whoever chose this locality for a naval base did a particularly good job, as it is much better than most tropical climates. We get very little rain. Even in the summer months, it did not get hotter than 92 degrees, and there was always a breeze which made it possible for one to get cooled off if one could get into the shade. Right now it is usually 85 during the day and 75 at night, so that we never have to wear a coat and have been plenty warm at night with only a sheet over us. Even though it is comparatively dry here, we have to keep an incandescent light burning in our clothes closets all the time in order to keep the dampness out. Otherwise, clothes would mildew very rapidly and spoil. It isn't wise to let dirty laundry lie around too long, but this is no problem as we have a first-class Chinese laundry here which gives four-day service.

"Minor purchases are made from the three Ships Service Stores on the base. Each of them carries a complete line of toilet articles, writing paper, ink, watches, uniforms, and all kinds of novelties. What you may not be able to find in one can usually be found in another. We have an excellent hospital here with first-class doctors and dentists available on call.

"Our Chinese cook, Hang, is quite a character. He comes from Canton, having left his wife and baby boy there in 1927. He is a good cook. His writing is in the form of printing, so he makes out his daily requisition for food by referring to a printed list which he has made from copying the names of cans, bottles, and so on. In this way he specifies so many cans of tomato soup, so many pounds of flour, butter, and so on. . . . We pay Hang fifty-three dollars a month for cooking and waiting on the table. He does not trust banks, so carries all of his money in a purse in his hip pocket. . . ." — JAMES A. BURBANK, *Secretary*, The Travelers Insurance Company, Hartford, Conn. STEVEN R. BERKE, *Associate Secretary*, Coleman Brothers Corporation, 245 State Street, Boston 9, Mass.

1917

Thanks go to Ted Bernard for most of the notes this month — not that he wrote them, but with gracious self-sacrifice he allowed me to use these facts gleaned from a local dinner on November 19. His own notes will appear next month. Apparently he had so much material in sight that he could afford to be generous.

President McNeill urged that local sections get together without waiting for the spring reunions, and one Henry E. Strout, New England manager for California Packing Sales Company, accepted and carried through the suggestion. Twenty-eight attended, including Horace Ford, honorary member of 1917. The meeting was brightened at one period by a contribution from the Class of '15, when Frank Scully was good enough to leave his guests elsewhere in the hotel and to play the piano for Louis Wyman and other songbirds. It will be recalled that '15 has figured in other '17 gatherings in the past.

Among those not present were Lucius Hill, who was attending a father-and-son

1917 *Continued*

dinner; Bill Bealer, who is living in Knoxville, Tenn.; Bill Eddy, who was out of the country; and Major Walter Harrington, who was reported in the Air Forces overseas. Jim Flaherty, who is at the Bethlehem Steel shipyard in Hingham, reported having seen Howard Hutchinson, who could not come because he was en route to New York to meet his wounded son who had been torpedoed in the Mediterranean.

The attendance did include Sidney S. Batchelder, Rudolph Beaver, Kenneth E. Bell, Ted Bernard, Kenneth M. Childs, Harold V. Chisholm, Clarence Cochrane, Irving B. Crosby, William F. Dean, Arthur D. Dickson, Joseph E. Doherty, Roland H. Eaton, James C. Flaherty, Hartley B. Gardner, Philip E. Hulburd, Harold A. Knapp, H. E. Lobdell, John A. Lunn, Raymond E. McDonald, William W. Rausch, Gordon W. Russell, Lewis P. Sanborn, Raymond Stevens, Julius L. Wettnaufer, Edwin M. Woodward, and Louis E. Wyman.

Everyone present spoke — from I. B. Crosby, who said his geological work for the armed forces was too secret even to whisper about, to Colonel Wettnaufer, regional field officer for the War Manpower Commission and personal representative for General Hershey in New England. Wettnaufer spoke at length on the subject of man power and management.

Art Dickson and Ted Bernard are both associated with the War Production Board in New England. — H. E. Lobdell said that his war assignments were so new that he suspected he had greater familiarity with any other person's job than his own and offered to swap for the duration. There were no takers! — Ray Blanchard was unable to attend but was reported recently elected a director of the Norfolk and Dedham Mutual Fire Insurance Company. — Ken Bell had little to say for himself but noted that Barney Dodge had recently sent to McGraw-Hill the manuscript of his new book on thermodynamics.

Bill Rausch is president of a company making homes on a mass-production basis. He promised that comfortable, insulated, and well-heated homes, ready for occupancy, could be bought after the war for \$2,500, which would mean that men with fairly low incomes could then own their own homes. The houses are sent out by trucks from the factories and can be erected within a week of the time the order is taken. The purchaser must own only the lot, as payment for the house itself can be arranged on a time basis over a period of 20 years.

Toastmaster Strout urged that everyone present write to Lieutenant Colonel Francis S. Conaty, United States Army, who is interred on the Philippine Islands. The address is Military Camp No. 1, Care of Japanese Red Cross, Tokyo, Japan, via New York City, New York, U.S.A. Fifteen words should be the maximum, and obviously no mention should be made of the war and certainly not of Japan if the letter is expected to pass censorship.

Official word that Tom O'Brien died as a Japanese prisoner came shortly after the last notes were prepared. Notice of his death appeared in the "M.I.T. Men at War" page of the November Review.

The Class has always claimed as one of its members Forrest P. Sherman of Melrose, who has made a great name for himself in his various Navy assignments, including

the command of the carrier *Wasp*. He was credited with saving the lives of 130 officers and men when the carrier was torpedoed in the Solomons. Sherman attended M.I.T. for only a short period prior to his appointment to Annapolis in 1914. He was graduated from the academy in 1917 and was top man in his Class. He has now been named a rear admiral.

Foreign Affairs for April included an article by Edward Warner, entitled, "Future Controls over German Aviation." — Recent address changes of interest include that of Mr. and Mrs. A. P. Dunham and the Dunham twins to Wellesley Hills. Lieutenant Colonel Alvah E. Moody is back in Denver.

Ted Bernard has circularized and threatened with blackmail several members of the Class whose replies should make most interesting reading next month. — RAYMOND STEVENS, *Secretary*, 30 Memorial Drive, Cambridge 42, Mass. PHILIP E. HULBURD, *Assistant Secretary*, Phillips Exeter Academy, Exeter, N.H.

1919

Here it is 1944, our 25th-reunion year. The Institute has decided to continue its regular graduating exercises. However, since it is graduating two classes in 1944 — one in February and the other in October — our 25-year reunion does not have to take place in June, as has been the previous custom.

This shift enables the Class to have its reunion, say, the last week of July or the first week of August at some central point for the majority of the Class, such as Connecticut. Definite plans and arrangements will be announced shortly. We now have 45 questionnaires answered for the reunion biography and should like to have questionnaires, photos, and bonds immediately in order to allow time for incorporating them in this publication. Your Secretary appreciates the co-operation of the various committees who have been working on this reunion. The Class had a dinner meeting at Karl F. Rodgers' home, 286 West 11th Street, New York City, on November 19, for reunion discussions. Present at this meeting were Alexis R. Wiren, Fred J. Given, Bernard S. Coleman, Herman A. Herzog, and Eugene R. Smoley.

E. H. Lawton is president and treasurer of the Hartsville Oil Mill at Hartsville, S.C. He is also president and treasurer of the Greenville Cotton Oil Mill at Greenville, S.C., and treasurer and general manager of the Palmetto Oil Company at Bishopville, S.C. — Bertram H. Southwick of 37 Elvir Street, East Lynn, Mass., writes that he is very much loaded down with war work. — Alan Richards of 340 Common Street, Belmont, Mass., wrote in regarding the reunion.

Alexis R. Wiren, 55 West Islip Road, Babylon, N.Y., is assistant superintendent of the group department of the Equitable Life Assurance Society. He has been active as the executive director of the Russian Student Fund, which he organized and administered and which has been the means of aiding more than 600 students in their training in United States colleges and universities.

The following address changes have been reported since the last Review: Max Kno-

bel's business address is now 30 Memorial Drive, Cambridge. — Lieutenant Colonel Henry S. Derby has an A.P.O. address. — Raymond G. Lafean's new business address is 2344 Oliver Building, Pittsburgh, Pa.

Dr. Frank Fremont-Smith is medical director of the Josiah Macy Jr. Foundation at 565 Park Avenue, New York City. He is a member of the committee on neuro-psychiatry of the National Research Council and also a member of the council's committee on selection and training of aircraft pilots. C. C. Likins writes from Kansas City, Mo., where he is with the Birmingham and Prosser Company, paper merchants. Paul F. Swasey continues his association with the Virginia Electric and Power Company in Norfolk, Va.

The New York *Herald Tribune* carried the sad news of the death of Robert F. Morrison, which occurred on October 16. He had been a lieutenant colonel of the United States Army Ordnance Department since 1941, on leave of absence as president of the Hastings Pavement Company. He died at his home, 32 Heathcote Road, Scarsdale, N.Y., at the age of 47. Morrison was graduated from Dartmouth College in 1918 and received his degree in mechanical engineering from M.I.T.

Fred R. Hewes, captain, Civil Engineer Corps, United States Navy, writes: "I was happy to find that Paul Swasey still lives here in Norfolk. Mrs. Hewes and I had the pleasure of having dinner with him and his wife and family several weeks ago. I hope that the reunion will go on as planned and that I shall be able to attend." Fred is at present public works officer, Naval Operating Base, Norfolk, Va., and Fifth Naval District.

Edward Adams Richardson, 1102 Linden Street, Bethlehem, Pa., is just finishing a report to the advisory committee on long-span suspension bridges, Bureau of Public Roads. "It covers the oscillations and failure of suspension bridges and shows how basic aerodynamics may be applied directly to the problem," he says. "It is possible to estimate wind speeds at which vibration can occur, and show factors determining whether a possible period will materialize and whether failure may occur. The report was originally commented on favorably by O. H. Ammann and by the late Leon Moissieff. It now goes to the analysis committee for consideration. A relatively small amount of wind tunnel work and some further studies should make calculations of that sort routine. Two inventions are described, both mine — one for cheaply stiffening bridges to prevent the rise of oscillations and thereby avoid failure, the other to introduce larger amounts of damping into the structure to reduce the tendency to oscillations. The former has been independently invented by David B. Steinman of New York and will be substantially applied in the repairs to the Deer Isle (Maine) bridge which nearly failed last winter and was severely damaged."

In his note Richardson included the information that Ralph Cartwright lives at the Allerton House, 143 East 39th Street, New York City, and that he is vice-president of an insurance company specializing in steel plants.

Roger T. Hall writes from Vallejo, Calif., as follows: "As my Army career in 1918 was too brief, I started in early in 1943

1919 *Continued*

as a lieutenant commander in the Civil Engineer Corps. . . ."

Art Blake, who lives at 3515 South Wakefield Street, Arlington, Va., was in New York and phoned me on the 12th of November. He is in the Pentagon Building, Arlington, Va., where he is a major in the supply division of the Air Forces.

Royden L. Burbank, whose home address is 39 Tennyson Street, Somerville, Mass., writes: "I enjoy The Review notes. I wish I had something of interest to send you for them. Many of the fellows are doing some very important work in the war effort. Your work is in a line where the contribution must be big, too. I hope to see you some time when you are up this way. I'm not sure whether I can get to the reunion, but I will try to do so if things work out right for it." — **EUGENE R. SMOLEY, Secretary, The Lummus Company, 420 Lexington Avenue, New York, N.Y.** **GEORGE W. MCCREERY, Assistant Secretary, 131 Clarendon Street, Boston 16, Mass.**

1921

Best wishes for the New Year. May your accomplishments toward victory be so outstanding and so speedily attained that you have time to write your Assistant Secretary what's going on *chez vous* and with the visiting Beaver.

Lieutenant Colonel Dugald C. Jackson, Jr., VI-A, and Mrs. Jackson are grandparents. Dugald Caleb Jackson, 4th, arrived on September 4, and Dugald C. Jackson, 3d, '40, and Mrs. Jackson are receiving congratulations at Portsmouth, N.H., where young Jackson — who is a lieutenant, junior grade — has been assigned to the industrial department of the Navy Yard since finishing the graduate course in naval architecture at the Naval Academy in Annapolis.

Dugie's second son, David, ensign in the Navy, was at the Mine Warfare School, Yorktown, Va., and has now been assigned to the research laboratory of the Navy Bureau of Ordnance in Washington, D.C., under Commander Ralph D. Bennett of the M.I.T. staff.

Dugie continues as executive officer of the instrument department at the Frankford Arsenal, engaged in the manufacture of equipment for army ordnance. Colonel Franklin Mitchell, X, heads the development and design section of the same group. Dugie reports a recent contact with George E. Shoemaker, Jr., VI, of the Philadelphia Electric Company. We suggest that visitors to Philadelphia seek out Dugie at Quarters 6 at the arsenal and deliver congratulations in person. On behalf of the many of us who were privileged to study under Professor D. C. Jackson, congratulations and good wishes are also directed to him at his home in Cambridge.

Larry Conant, XV, Adjutant General's Office, Washington, D.C., shares the vital statistics laurels with the Jackson and Zoller families in having passed the cigars about a year and a half ago on the arrival of a son. Bill, the eldest boy, entered the Institute with the class of 2-46. George, who is 15, and Peggy, 14, help with the annual football and baseball coaching and the organization of the various "Dad's" clubs which Larry somehow manages to include in the hours after he emerges from the puzzling Pentagon.

S. Paul Johnston, II, is Washington manager of Curtiss-Wright Corporation. — Clark Greene, X, has returned to the New York area after having been located for some time in Toronto. He is with the M. W. Kellogg Company and lives in New Rochelle, N.Y. — Paul L. Hanson, II, has deserted Buffalo after all these years and is now in Detroit, Mich., where his address is 2480 Bellevue Avenue. Eliot Underhill, X, recently appointed general plant superintendent of the new mill of the Manganese Ore Company, writes that his new address is 2027 Vallejo Street, San Francisco, Calif. — Reginald W. King, VI, has returned to the United States from the Bahamas and can be reached at 1531 Catalonia Avenue, Coral Gables, Fla.

Those of the Class in service now number 96 in the Army and 33 in the Navy, or 14.5 per cent of the total registration during our undergraduate years. Changes in rank and new commissions are listed in the "M.I.T. Men at War" section of The Review.

We must be brief to conserve paper, but there won't be any notes at all unless you include a resolution to write now. Use V mail, air mail, or just a penny postal — this minute while you're in the mood. — **RAYMOND A. ST. LAURENT, Secretary, Rogers Paper Manufacturing Company, Manchester, Conn.** **CAROLE A. CLARKE, Assistant Secretary, Federal Telephone and Radio Corporation, 1000 Passaic Avenue, East Newark, N.J.**

1922

The importance of woman power in the war effort is brought out by the announcement that Frances H. Clark, metallurgist for the Western Union Company, New York City, is serving as an engineer at the Frankford Arsenal in Philadelphia for two days each week. — Colonel Abraham G. Silverman, XV, formerly stationed at the headquarters of the First Corps Area, is now supply officer at the Army's general headquarters for the Southwest Pacific area. — Jerome Meier, VI, formerly with the Tung-Sol Lamp Works, has been named electrical engineer for United Electronics Company of Newark, N.J.

Edwin Terkelsen should be delegated to run the next reunion. Ed headed the executive committee of 33 citizens who ran Halloween parties for 12,000 children of Greater Boston. These pupils of the public, private, and parochial schools gathered at schools, churches, and clubs throughout the city for the occasion, which was underwritten by the chamber of commerce, the city recreation department, the parent-teacher association, and 60 civic clubs. The entire project was pronounced an outstanding success, and the gates, fences, piazza furniture, and doorbells of Boston did not take the beating that they had in former years.

The drama for the month is furnished by Lieutenant Colonel Richards J. Bard, who has returned to his home in Wayne, Pa., for a furlough after nearly three years in the Far East. On arriving in the United States, Colonel Bard found that Mrs. Bard was on a vacation in New England at some unknown destination. The Red Cross was enlisted to aid the colonel in communicating with her. Fortunately, he was successful. Later Dick visited Charlie Locke '96 and told him that he had cabled Mrs. Bard before he left the Pacific district but arrived

THE TECHNOLOGY REVIEW

home before the cable did. Let's hope he will be around at one of our meetings to tell us some of his experiences. — **CLAYTON D. GROVER, Secretary, Whitehead Metal Products Company, Inc., 303 West Tenth Street, New York, N.Y.** **WHITWORTH FERGUSON, Assistant Secretary, Ferguson Electric Construction Company, 204 Oak Street, Buffalo, N.Y.**

1923

Walter A. Metcalf, as exchange officer for United States Army forces in the Far East, operates all the post exchanges scattered wherever American soldiers are stationed in Australia and New Guinea. A press release from the General Headquarters, Southwest Pacific area, somewhere in Australia, summarizes Walt's recent career by reporting that he was directing the operating work of the Atlantic and Pacific Tea Company in New England when he joined the Navy as a lieutenant commander in 1941. Soon after Pearl Harbor, he was assigned to duty with the Army in Australia. In July, 1942, he resigned from the Navy to accept a commission as lieutenant colonel in the Army. He then became chief of procurement for the general purchasing agent for all United States forces in the Southwest Pacific theater, taking over the exchange service early in 1943. His most recent assignment is that of acting special services officer for that area. He moved to Wellesley, Mass., in 1941, where Mrs. Metcalf and a son live at present.

W. E. R. Covell, promoted to the rank of major general in October, was the subject of a thumbnail sketch in the Washington Star of August 8, in which his name was linked with that of Lieutenant General Breton B. Somervell and J. Edgar Hoover as former classmates at Central High School. When he was promoted to brigadier general, he was assigned as director of the fuels and lubricants division of the Office of the Quartermaster General. A news story with a November 16 date line from New Delhi, India, reports his arrival there to assume command of the United States Service of Supply Division in that area. While he would not elaborate on his new duties, he commented, it is reported, that the High Command considered the Southeast Asia theater one of the most important at this time.

Colonel A. B. Johnson is now director of internal security for the Office of the Provost Marshal General, Washington, D.C. — I ran into C. S. Keevil in Washington in November. He is professor of chemical engineering at Bucknell University, Lewisburg, Pa., and is currently at Edgewood Arsenal, Md., on an assignment for the National Defense Research Committee. — **HORATIO L. BOND, Secretary, 457 Washington Street, Braintree 84, Mass.** **JOHN M. KECK, Assistant Secretary, 207 Bloomfield Avenue, Bloomfield, N.J.**

1924

Frank Barrett sent the following news from New York City: "Rock Hereford has temporarily given up his investment business and is running a department of a Republic Steel shipbuilding plant in Los Angeles. He started as an expeditor. I talked with Archie Carothers and learned he is busy with war materials for aircraft factories. Coming east across the desert, Mrs.

1924 Continued

Barrett and I stopped at a small town called Banning and visited with Bill Correale, who was there with the Army Engineers. He looked fit after a spell in the hospital. Bill said Wink Quarles was then at a camp on the West Coast. I learned in November that Don Moore had moved from Camp Edwards in Massachusetts to a Los Angeles post. At last reports, Quarles and Moore were lieutenant colonels. Chris Conway transferred to the American Telephone and Telegraph Company in New York this fall, after many years with the New England Telephone and Telegraph Company."

George Parker can now be addressed at Brunswick Road, Rural Delivery 3, Troy, N.Y. He writes: "My wife had a baby girl on November 3. From my first marriage, I have two children and an adopted son, now all grown up, but this is Madeline's first child and we are both delighted. I left Boston last April to direct industrial engineering for Cluett-Peabody and Company (Arrow shirts). We have a nice little home in beautiful country. Frank Warren stopped in for lunch about midsummer."

From Anatole Gruehr comes news that Greg Shea is back in New York and is now production manager for Electronic Industries, Ltd. Gruehr wrote: "Greg looks well and has acquired some of the distinguished appearance that characterizes Frank Barrett."

Thanks to Charles E Locke '96, Alumni Secretary, we learn that Don Kennedy has been transferred from the Pittsburgh station of the Bureau of Mines to Washington to take charge of the metal mining section of the mineral production security division of the bureau. — Don Fife is now in New York in the engineering department of the United States Rubber Company. Ray Lehrer has moved from West Newton, Mass., to Washington, D.C. Elmer Brugmann is now at the University of Chicago, where he is connected with the metallurgical laboratory. Alexander Liff has moved from Pittsburgh to Burlingame, Calif. Jack Parsons has left Buffalo for Arlington, Va.

The latest news from Chick Kane on Alumni Fund progress brings the good news that on October 30 the Class was already ahead of last year in amount of contributions. Quota standings for '24 show that we have reached 67 per cent of our quota for the number of contributions and 50 per cent of our dollar quota. — FRANCIS A. BARRATT, *General Secretary*, 195 Broadway, New York, N.Y. GEORGE W. KNIGHT, *Assistant Secretary*, 36 Arden Road, Watertown 72, Mass.

1925

Last month I said that "if the letters and clippings continued to come in," there would be '25 notes in every issue of this volume. Being on a new job gives me even less time than usual to correspond with classmates, so the letters will have to be to a large extent self-starting. Except to give my new permanent address, I have but one item this month, a letter from Ted Butler, a lieutenant commander, who wrote from the Pacific theater last April. I had it in time to include in last month's Review, but (with apologies to Ted) I have to report that it was temporarily mislaid. He wrote: "It isn't very often that I have taken pen in hand in the last, I hate to say how many, years, but my February Review caught up

with me in my Southwest Pacific tropical paradise and (much to my horror) I found myself listed as being in the Army. I haven't anything against the other branches of the armed services — but the old school tie you know. For the sake of the record, let me say that I have been afloat and ashore since June, 1942, in the Civil Engineer Corps (which by the grace of something includes electrical engineers) or, colloquially, the Seabees.

"Life is interesting and there is usually something doing a fair share of the 24 hours, though the United Service Organizations haven't caught up with us as yet. Engineering on an advanced base is somewhat different from what it is indicated to be in the average textbook or as I have found it in civilian life, but it can all be chalked up as good experience, I expect. Hope all is well on your end."

My new mailing address, given below, is located about one mile southwest of the separation of Alternate United States Route 67 and Illinois Route 111, in the town indicated. I am about 20 miles outside St. Louis. Members of the Class passing through are welcome. — HOLLIS F. WARE, *General Secretary*, 410 Prospect Street, Wood River, Ill.

1926

Congratulations to the following officers upon their promotion to the ranks indicated: Major Robert W. Rogers, Lieutenant Colonel Robert E. Mattson, Colonel Edward J. McGrew, Jr., Colonel Earl S. Gruver, Lieutenant Colonel Maurice L. Ash, Jr., Major T. Hooker Barry, and Major Joseph D. Bates, Jr.

Malcolm A. Jenckes has been appointed manager of the special risks department of the Security Insurance Group of New Haven. After leaving the Institute, Jenckes was employed by the Grinnell Company and subsequently by the safety and fire protection division of the Du Pont company. Since 1931 he has been identified with the western regional office of the Western Factory Insurance Association in Chicago.

Evan F. Wilson, chief metallurgist for the Babcock and Wilcox Corporation, Barberton, Ohio, has been appointed chairman of a technical subcommittee on heat- and corrosion-resistant products to work with the ferrous foundry industry advisory committee to the War Production Board. — A. E. Cameron, Deputy Minister of Mines of Nova Scotia and Vice-president of the Mining Society of Nova Scotia, has fully recovered from his long illness earlier in the year which kept him confined for several weeks in the Royal Victoria Hospital at Montreal. He is now back at work in Halifax. — Roger Macdonald has changed his address from Fort Madison, Iowa, to 5 Holmes Court, Glenbrook, Conn.

The Secretary regrets to report the death on April 5 of Charles G. Schmidt, who was in the Course in Electrical Engineering. — JAMES R. KILLIAN, JR., *General Secretary*, Room 3-208, M.I.T., Cambridge 39, Mass.

1934

We received from Brad Ellenwood a newsy letter which breaks a long silence from the brethren. It is encouraging to

know that at least one member of the Class does not have a paralyzed hand. On October 30, he wrote the following: "I haven't seen anything about the Class in The Review for many issues. I expect it's because guys like me don't bother to drop a line once in a while. It is tough, though, to find any spare time in which one feels like writing a letter. . . . I am still with the Lukas-Harold Corporation, Indianapolis, helping to make precision instruments for the Navy at the naval ordnance plant here. Uncle Sam seems to feel I'm more valuable here than out where things are really popping. (The Seabees are calling, though.) The firm has changed my job from plant engineer, in charge of plant operation and maintenance, to project engineer, supervising the job of putting some new instruments into production, with such accessory jobs as handling the construction of a recreation area and park on an 80-acre farm, and the formation of an optics department and an optics inspection and testing group. We now have several M.I.T. men in the organization here. Among these are B. R. Haueisen '23 and Virgil Otto '43.

"I heard from Robert M. Becker recently. In fact, he was considering joining our organization before he went with Raytheon in Watertown, Mass. Strange, but he's another Course XVII construction man who is now in manufacturing — in fact, in project engineering work. Bob's little girl is a whiz now. I've been planning to look up Sam Crew, XVII, in Cincinnati. We were going to go to Beverly Hills, the famous midwestern night spot, but gas rationing changed all that. I hope everything is going all right with you. Maybe others will be shamed into writing, as I was, and then we shall be able to read something about our classmates."

The Secretary ran into Les Doten at a meeting of the American Management Association in New York last November. He is now with the Johns-Manville Corporation and is working on their budgetary control at the New York office. There are now two young Dotens: William Leslie, 3d, age two years, and Diane, age six months. Les says to tell his old friends to look him up if they are in the vicinity of New York. His address is 16 Rockland Avenue, Larchmont, N. Y. — JOHN G. CALLAN, JR., *General Secretary*, 184 Ames Street, Sharon, Mass. ROBERT C. BECKER, *Assistant Secretary*, Special Service Force, care of Postmaster, Seattle, Wash.

1935

It is now the better part of a year since your Acting Secretary has raised his ugly head (which is now hanging in shame) and moved toward the typewriter. He can hope only that everybody has been busy enough to know how he feels. During these lean months we have been collecting a smattering of news. A large part of it has unfortunately been gleaned from the papers rather than from personal letters, so how about a little more co-operation? Any artist needs inspiration.

The social columns report the following weddings: Evengela Sandys to Lieutenant Colonel John R. Burton, Jr., in London; Anna Trivelli to W. Gregg Fry, a lieutenant, junior grade, in the Naval Reserve; Maren Lee to John C. Quinn, also a lieu-

tenant in the Naval Reserve; Evelyn Haley to Vinton Ulrich; and Janet Post to Paul Herkert. The engagement of Madeline Hamersma to Duane Davis, and that of Jane Noble to Rodney W. King have been announced. Finally, Ralph Stockmayer and Deborah Lynn Nelson were born last summer.

It would be nice, but a tough job, to give in this column the ranks and promotions of all our servicemen, so we refer you to The Review's tabulation on the M.I.T. Men at War page, on which are also listed decorations and citations. We'd like, however, to mention that Walter R. Daley, a lieutenant, junior grade, has been commended for "outstanding devotion to duty" as commanding officer of a naval armed guard on a merchant ship repeatedly subjected to enemy bombing.

On the home front, we have heard that Beverly Dudley, our outstanding scientific author, has become western editor of *Electronics*, having previously been managing editor. Earle Megathlin is now assistant purchasing agent in the radio division of Westinghouse and is stationed in Baltimore. Fred Haigh, after a term as chief of the Office of Price Administration's chemical and drug division in the New York regional area, is now with the Botany Worsted Mills in Passaic, N. J. Your Acting Secretary has moved from Columbia back to Technology, where he now wears the disguise of an assistant professor in the Department of Chemistry.

Arthur Zich wins the gold-plated cuspidor for excellence in personal correspondence. Zich, a lieutenant in the Signal Corps, was stationed in Asbury Park when he wrote. He reported that Bob Leventhal is working as a civilian in the Boston Navy Yard, or at least that he was until he broke a leg while patriotically bicycling to work.

At the halfway mark in the 1943-1944 Alumni Fund campaign, our Class had not yet reached its quota of subscribers. We must have a few rich men in the Class, though, because the amount contributed was relatively more impressive than the number of donors. Anybody who has seen the Institute at work during the war will agree that it deserves the support of each one of us. Send that contribution today! — WALTER H. STOCKMAYER, *Acting General Secretary*, Room 6-227, M.I.T., Cambridge 39, Mass. DUDLEY A. WILLIAMS, *Assistant Secretary*, Room 6-127, M.I.T., Cambridge 39, Mass.

1937

The news of the death of John Gander on October 10 at Aberdeen Proving Ground was hardly believable. I contacted Walt Blake, who wrote: "John's death was a sudden blow to all his associates. His funeral was a military one, with burial in Arlington Cemetery. John had just been promoted to major and he had been married quite recently."

John's father, who is registrar of the New York Military Academy at Cornwall-on-Hudson, has established the Major John H. Gander Memorial Scholarship at the academy. Brigadier General D. Armstrong, commanding officer at Aberdeen, in a letter to him, said: "I am greatly impressed and delighted with the appropriateness of establishing a scholarship at the New York Military Academy to be

known as the Major John H. Gander Memorial Scholarship. No young officer of our new Army served more faithfully, more efficiently, and more loyally than did your son, and the boy who wins this scholarship should know the type of man who has given his name to the scholarship under which he is obtaining his education."

Walt Blake also mentioned in his letter that Harry Goodwin, a captain, is still at the training center in Aberdeen, that Jack Robbins, a major, is still the anti-aircraft gun expert there, and that Quentin Berg, also a major, is around occasionally but is stationed at the Tank-Automotive Center in Detroit. — WINTHROP A. JOHNS, *General Secretary*, 34 Mali Drive, North Plainfield, N. J. PHILIP H. PETERS, *Assistant Secretary*, 159 Glen Road, Wellesley Farms 82, Mass.

1939

As '39 breaks into print again (finally), the first item reports that Nick Shoumatoff has a new baby, of whom he is very proud. Nick, who was formerly with the West Virginia Pulp and Paper Company, is now an ensign. — Mike Goldberg was married early in October to Grace Meltzer of Cambridge, Simmons '40. Mike is with the Navy Department, working in Portsmouth, N.H., and is now "settling down to being a smug old married man."

A memorandum received some time ago states that Olaf Rove has accepted an appointment as chief of the manganese and chrome ore section of the ferroalloys branch of the War Production Board. — Last word of Will Jamison showed him to be an ensign in the Naval Reserve. He trained at Fort Schuyler. Previous to that he was chief engineer of the Jamison Coal and Coke Company in Greensburg, Pa., where for two years he was engaged in layout, design, and construction for two coal mines, one capable of producing 6,000 tons of coal a day and the other 3,000 tons a day. In addition he had charge of engineering at the seven other mines of the company.

We hope that John Evans, an Army captain, has received a picture of his son, Theodore Warren, who is almost one year old now. John has been bouncing back and forth from Alaska to Florida so often that no attempt will be made to predict his present whereabouts. — Emmy Emerson and Leigh Hall were scheduled to finish basic flying school in Texas in October. Bus and Leigh have dogged each other's footsteps for nigh onto eight years now, and are still together going strong. Leigh, by the way, was married last April to a nurse in San Antonio.

According to the most recent report, Dave Bartlett is in training at the Naval Academy in Annapolis. He was associated with the Phillips Petroleum Company and later was president of the Keener Oil and Gas Company in Tulsa, Okla. — Via the press clippings, we learn that Fred Sheldon, an Army captain, was married to Anne Mehaffy of Little Rock, Ark. Fred is attached to headquarters of the medical replacement center in Camp Robinson. Bob Stone was married to Virginia Nichols, and they are now living in Seattle.

A newsy letter from Captain Paul Stanton reads as follows: "I was recently assigned to the Springfield Ordnance Dis-

THE TECHNOLOGY REVIEW

trict. In my travels I have met quite a few of the gang. Jim Smith is in Washington, D.C., working on some engineering problems for the Ordnance Department. Morrie Nicholson, a lieutenant assigned to the Springfield Armory, was married several months ago. It was a wedding at which the Institute was more than well represented, with Bill Pulver, Lieutenant James Laubach, Jim Gilliss '38, Captain Sam Brown '35, Captain Art Gould '38, Frank Garner, Borg Nissen '40, and many others present. C. J. Stacey is still with Corning Glass. He has also recently been married. When Major Hal Seykota was at the Aberdeen Proving Ground, among other duties he played the tuba and led the band.

As regards reunions for '39, nothing formal is being planned for the duration. Your Secretary is being transferred to the Far West, and he hopes sincerely that there will be numerous get-togethers of the clan in all parts of the globe. — STUART PAIGE, *General Secretary*, Fairport Road, Westfair Village, Westport, Conn. ROBERT C. CASSELMAN, *Assistant Secretary*, 271 Cypress Street, Newton Center 59, Mass.

1940

An American Red Cross bulletin from Worcester, England, brings news of Bill Peck, who is working in radio location with the Royal Air Force. The bulletin speaks of Bill's having wandered into the newly opened American Red Cross club there. As a specialist in the radio field, Bill can't say too much. The article does quote him as saying the following: "The British as technicians are darned good. Under the urge of necessity they've gone ahead with developments along some lines that we didn't work on until after we were in the war. They've been working all along under extreme difficulties that we didn't know anything about in the States." A number of you fellows may remember that Peck's favorite hobby was playing the organ. I can recall numerous Sunday mornings when he got us up plenty early to remind us to attend church to listen to him play the organ. Well that still seems to be his favorite hobby, for he has played the organs at Westminster Cathedral, Westminster Abbey, Alexander Palace, Lincoln Cathedral, Worcester Cathedral, and at Liverpool Cathedral. The Liverpool Cathedral organ is said to be the largest in England. The article concluded: "Soon Peck may not be wearing the Civilian Technical Corps uniform, for he expects to transfer to the United States Army as a lieutenant. But he is doing such a splendid job that even though he will wear the United States Army uniform, he will continue in the same job."

Dixon Speas is making a name for himself with American Airlines. We all knew that he would, and the latest news I have about Dix is that he is assistant to the Vice-president in Charge of Engineering. Dix won first prize in a contest sponsored by the Air Transport Association for original research in flight operations. This contest was open to anyone connected with flight operations in all member air lines. The first prize of \$250 went to Dix for a flight-plan analyzer and altitude selector. This invention will not only provide the air-line pilot with graphic information concerning flight conditions and winds he will en-

1940 Continued

counter on his flight at all altitudes, but it will also tell the pilot how much time will be required at each cruising altitude and how much fuel will be consumed between stops. Speas tried out his machine on the Boston-New York route, where it estimated the flight-time within one and two minutes of that actually required. It also enabled the pilot to copy his flight plan in less than a quarter of the time previously needed to calculate it. Dix had been working on this problem for two years and had made six models before his prize-winning one.

James H. Campbell, a major, has been assigned to the Field Artillery training section at Tenth Corps headquarters in Sherman, Texas. In civilian life he was an engineer for the Ohio Edison Company. He had previously received the Sloan Fellowship. — Robert S. Nelson, a Navy lieutenant, was commissioned an ensign about two years ago and has spent much time overseas. He is now executive officer with a torpedo squadron. — Jean Lewis has been working for the War Department at Edgewood Arsenal, where he has been assigned to the production division. — K. T. Jackson, a lieutenant, writes the following note: "I'm in England, bored stiff and hoping we'll be included in the second front. We are living fairly comfortably in Nissen huts and doing work that at least approaches civilian technical work. Have seen a few M.I.T. men, but none from '40 and would like to hear from any classmates."

Professor and Mrs. Albert W. Schlechten announce the birth of Mark Albert, on September 24. Credilla B. Wickham and William J. Schnorr, a navy lieutenant, were married several months ago in Washington, D. C. Bob Grossfingher, also a lieutenant in the Navy, was an usher. Inez Rowland and Ensign A. W. Earl were married last spring.

John Danforth, who is working at the Institute, is carrying on as acting assistant secretary while Tom Creamer is in Washington. The rest of the news in this column was sent in by John.

Several more names should be added to the list of classmates who are now at the Institute. Fred Watriss, Mike Witunski, and Larry Bernbaum are working in the Wright Brothers Memorial Wind Tunnel, and John Arnold is an instructor in Mechanical Engineering. John Halford, Jr., commutes from his home in Andover to one of the research laboratories out behind the main buildings. He joined our Class in Course XV after studying physics at Bowdoin. Dick Lawrence, Ty Marcy, and Herb Weiss are also here. Herman Bartholomay, who has been an ensign since May, has been assigned to the Institute for a special course.

Plenty of news comes from those who are in the services here and abroad. Allan MacKay writes that he is a lieutenant in the Royal Canadian Engineers, serving overseas. Beno Goodman is reported to be with a fighter command. Undoubtedly he organizes reunions with Technology men wherever he is.

In July, Al Ackerson was married to Marjorie Wagner of Jackson, Mich. After finishing Air Corps cadet training, he was commissioned, and in October he became station weather officer of a weather squad-

ron detachment at the air base in Blythe, Calif. Al and his wife are living near the base in Blythe, a town right in the middle of the California desert. Once he flew over to see First Lieutenant Bob Stocker, who was stationed with an Ordnance outfit at a camp about 60 miles away. Captain Bill Crater is also an Air Forces weather officer.

From North Africa, Bill Taylor sends his regards to his friends in the Class. He has been overseas since May, 1942. Captain Dave Morganthaler covered North Africa from Tunisia to Casablanca. From his experience working on airdromes with the Aviation Engineers, he has become a real "cow pasture" engineer. Last summer Malcolm Johnson was married to Edith C. Eastham, Simmons '42. As an Air Forces lieutenant, he is now first pilot of a Flying Fortress.

Dick Erickson interrupted his graduate work in geology at the University of California to join the Marines. He now holds the rank of captain and is serving in an active area in the Southwest Pacific. In July, Lieutenant Harold Miller was doing inspection work for the Signal Corps in St. Louis. Alan Thewlis, a lieutenant, junior grade, is working on the inspection and trials of submarines in New London. Kendall Valentine has been in the Navy since October, 1942. For a time last summer he was stationed with an anti-submarine warfare unit in Florida. Wylie Kirkpatrick turned hillbilly out in Kansas with the Army. He was with an engineer battalion. We have heard nothing about him since. When he reported this summer, Lieutenant George Rosenfeld was in the office of the Supervisor of Shipbuilding in New York City.

Russ Winslow has established a welcoming committee for the Class in Seattle, Wash. He promises good fishing and camping in the summer and possibly a skiing trip up Mount Rainier in the winter, for special visitors at least. Right now he is working on calibration and maintenance of instruments for flight test planes at Boeing. Down the West Coast, Stanley Snowdon received a Ph.D. in June from California Institute of Technology.

Saul Namyat was married in June to Sylvia Libber. He is at Curtiss-Wright in Buffalo working with Harold Cheilek, who is in the research laboratory, and with Walter Brewer, who is in charge of the new wind tunnel in Williamsville. J. J. Casey left Curtiss in the summer of 1942 to become an Air Forces pilot.

Paul Alberti engineers aircraft armament at Vought-Sikorsky in Stratford, Conn. With him are Bob Pickett and Roy Tuttle. He says he hopes some of us are flying our Corsairs. Paul visited Gil, Betty, and little Cynthia Tougas in New York, where Gil is working for Procter and Gamble. He also writes that Johnny Simpson is abroad with the Seabees as a chief petty officer. Bob Pickett was married on August 28 to Audrey O'Neil of Hull, Mass.

Harlan Davis is now doing procurement engineering for the propeller division of Remington Rand in Johnson City, N. Y. He wrote from Chicago that most of the plants he visits could use a little XV. We have one man in a pleasing field: Bill Stone is production superintendent of the Old Colonel Distillery in Midway, Ky., a subsidiary of Seagram's. He claims that

there is not another Technology man in that part of Kentucky. Andy Kopischiansky lives in Bedford, Ohio, and works for Jack and Heintz. At the last meeting of the M.I.T. Association of Cleveland, he saw Don Harper, who is connected with A. G. McKee, and John Brauning, who is with the National Carbon Company.

The engagement of Betty Ann Bryson to Captain Ray Foster was announced in Garden City, Long Island, on September 25. No word has been received as to where Ray is stationed. — H. GARRETT WRIGHT, *General Secretary*, 1124 Greenwich Street, San Francisco 9, Calif. THOMAS F. CREAMER, *Assistant Secretary*, Room 7, 1901 Constitution Avenue, Washington, D. C. JOHN L. DANFORTH, *Acting Assistant Secretary*, Room 24-123, M.I.T., Cambridge 39, Mass.

1941

This is a good time to remind you that the Alumni Fund is still rolling along. Our Class has been "outfunded" by a mere three classes from 1910 on. I can see little reason why we cannot get behind our Class Agent and push — push the Fund. What it stands for is understood by all.

We have been getting a flock of clippings on '41 men and are about to start an historical album of their activities. It has occurred to us that a parallel book of pictures would augment to a considerable degree the interesting background of such a history. The way in which the service does this is quite surprising. The sources of many interesting discussions back in military history classes come to light in observation of the current history keeping of the Army.

Appeals have been issued in the past for letters describing your activities. We are afraid that in addition to merely being out of the habit of writing, you tend to shy away from anything personal which might be put in print by our blundering quotations. May it now be said that our intention is not to spread personal gossip but rather to let you know what the fellow who blew up the test tube at the other end of the bench is doing. May we again ask for letters from you, busy as you may be, thus allowing us to post the class history with your share in it.

We also request that you send in, if you can, an extra snapshot of yourself or part of the '41 gang taken since graduation in June of that never-to-be-forgotten year. The pictures will be collected in a class album and will no doubt bring you pleasure to look back on, come our next class reunion. Any suggestions along these lines or about any other way to keep our Class well posted will be appreciated.

A note was received saying that Henry Faul is an assistant geologist with the Union Mines Development Corporation. Again on the home front, Shadburn Marshall, a metallurgist in the research laboratory of Remington Arms, was awarded the Henry Marion Howe Medal in Chicago by the American Society for Metals for the best paper on research work. Zack Abuza sent in a note mentioning that Peter and Bobbie Gilmer had a baby, named Penny Jane Gilmer. Pete is now overseas wearing crossed flags.

The engagement of Susan Wolfe of Portland, Ore., to Lieutenant Eugene E. du P. Crawford has sifted through to the lowlands of Louisiana. Where once interesting

1941 *Continued*

letters were received, we have nothing but engagements. — Bob Mayer is still holding down that job with General Electric in Schenectady, and is working away as usual, we presume. Carl Mueller, Charlie Muller, and Jim Ryan have picked up sets of railroad tracks. Jim is with a bombardment group of the Air Forces. Ed Sheridan has also left the rank of the 'loots,' and Jim Sligar, a major, has joined the field officer group. Charlie Papas is holding forth in the nation's capital, while Charlie Wyckoff is working in the Electrical Engineering Department at the Institute.

Bud Ackerson, with a lieutenant added, is working at Frankford Arsenal in the Friendly City. Joe Bergantz has dropped his professor title and now is a captain, United States Army. 'Tis said that both Charlie and Bill Butt are captains at Wright Field. We are surprised not to have heard from either for some time.

Ced Chandler is a radio technician in the Naval Research Laboratories in Washington. Leon Crane has an A. P. O. Seattle address. Bob Ferguson is with the Aeroproducts division of General Motors in Dayton, Ohio. Charlie Gillispie has been promoted to lieutenant, Pete Horton to captain, and Dick Langworthy to captain.

We mentioned in December that we would have more information concerning Bill Doughten. He was called into active service immediately upon graduation and entered Edgewood Arsenal, Maryland, June 15, 1941, as a second lieutenant. He served as adjutant at headquarters and headquarters company and also had some training in company leadership. When cadre was formed for a new battalion, Bill volunteered and on June 10 left for Camp Gordon, Ga., where his chemical battalion was formed. He again served as adjutant at headquarters and headquarters company; then as commanding officer of headquarters and headquarters company, and at the same time as communications officer of the battalion. In April, 1943, the battalion left for Africa. On June 20, Lieutenant Doughten was made executive officer of his company. On July 9 during the invasion of Sicily, Bill volunteered to go with three men in a small craft for speedy reconnaissance for a position for his company mortars, which were following him on a second wave, but he never cleared the beach. This incident was before dawn on July 10. The way in which he instructed and trained his detail was so well done that when he fell his men were able to carry out the mission successfully. His commanding officer said: "I can give him no higher praise than that. The help that he gave his company in preparing it for its work contributed greatly to the success which this battalion gained. The landing was made under heavy artillery and machine-gun fire, and speed was necessary."

One of Bill's fellow officers wrote: "He would do anything at all for the success of his unit; while others relaxed, Bill stuck to his work. He was a hard worker for the battalion, showing much initiative, and was exceedingly well informed. Bill's profound regard for his men was fine and good. Nothing was too hard for him to do, nor hours too long, if such work and hours contributed to the welfare of his men. In all sincerity, I find words inadequate to express the high regard I had for Bill, and I count it a privilege to have known him well and to be able to call him a friend." — On September 24 Lieutenant Bill Doughten was posthumously awarded the Purple Heart. Our sincere condolences go to his

parents and also our appreciation for the information they furnished us about their son's supreme sacrifice. — STANLEY BACKER, *General Secretary*, 46 Bicknell Street, Dorchester 21, Mass. JOHAN M. ANDERSEN, *Assistant Secretary*, 136 Beacon Street, Boston 16, Mass.

1942

Most of the news this month is from indirect sources. This fact shows that many classmates are breaking into print. The armed forces still seem to be making most of the contributions. Captain Tom Crowley, who has been cited for bravery twice since last March, recently sent home a Silver Star. Lieutenant Bill Horton of the Naval Reserve and the former Helen Irving may still be in Miami, Fla., where they were married in September. Freddy Gander, also a Navy lieutenant, has announced the arrival of Freddy, Jr.

The loss of two stalwarts of the eligible bachelor class has been deeply felt by some of us. Paul Bruckmann and J. T. Coe are no longer part of the "see you at Jake's" group. Paul, stationed at Philadelphia as an aviation supply officer with the Royal Navy Volunteer Reserves, was married in late October to Ruth Smith. J. T. Coe, the elusive one, since last heard from has become both a husband and an ensign. Elizabeth Muir was the bride at a festive affair in Schenectady, which drew such illustrious Chi Phi's as Joe Tankos, Frank Seeley (a Navy lieutenant), Paul Bruckmann, and Hank Henderson (a Navy lieutenant of Washington fame).

Jack Madwed, somewhere in the Middle East, is now a first lieutenant. Ed Thode plans to marry a West Medford girl, Isobel Zoeller, next June. None other than one Ben Skinner, former driver of the "Master Eagle Six," was married in South Orange, N.J., to Angela Gottfried, and they have now set up a household in East Orange after a honeymoon in Nantucket. Barrett Russell '43 was one of the ushers, and rumor has it that Harry Blakeslee was best man.

Henry Anderson, VI-A, and Frederica Woodall plan to marry about March. Warren Menke chose Charlotte Robinson of Winchester, a Radcliffe girl, to become Mrs. Menke on September 14. Bill Shakespeare and Mary Sage (the daughter of Nathaniel Sage '13) were married in Brookline early in October. The engagement of Anna Danzer to Bill Whitcomb, who is now studying medicine at Boston University, has been announced. Albert Root and Jacqueline Waldron announced similar intentions in June, and probably have made their home near Boston by now. Rodman Flinchbaugh and Ruth Jones were married near Boston in September.

Lieutenant Hank Titzler, Captain Ted Walkowicz, and other classmates are now at California Institute of Technology, continuing along Course XVI lines. They are pursuing masters' degrees, in view of returning to Wright Field, perhaps, for work on development of future planes. — On the more dismal side of aeronautics comes word that Charles Frederick Leiserson, an ensign, was killed on September 20 at the Westerly, R.I., airport while flying a torpedo bomber in an operational flight. — Francis M. Costello, Jr., a lieutenant, who was still training for his wings in the Army Air Forces, was killed on May 17 near Freeman Field, Ind. He was learning to fly twin-engine advanced training planes.

Of late, news has been lacking from many sources. What has happened to the venera-

ble Hawk Shaw, Gangrenous Stempf, Aloysius Al Clear, Bob Fabacher, Olly Johnson, and others you can think of? Maybe you know something about them or about other '42 men. And we'd like to hear something about you, too. And how about a boost or two to our illustrious Class Agent, to help put our record on the Alumni Fund up where it should be? — FREDERICK W. BAUMANN, JR., *General Secretary*, Golf, Ill. KARL E. WENK, JR., *Assistant Secretary*, 228 Marlborough Street, Boston 16, Mass.

1943

Very special honors go to Mr. and Mrs. Jack McDonough. Jack writes: ". . . We had an eight-pound two-ounce girl at 5:45 A.M. on September 17. She is the cutest little blonde, blue-eyed baby I've ever seen (naturally)."

More news is given of Jack in a letter from Lieutenant Ned Swanberg, who is stationed at Camp Beale, Calif. He writes as follows: "I have really been around this old country. After graduation, I went to officer candidate school at Aberdeen, and got my bars in May. I decided that then was the time to get married and chose Ruth Mattson as the bride. From Aberdeen I was sent to Fort Knox, Ky., where I stayed about two months. Since then I have been with an armored division here at Camp Beale. Jack McDonough is in Boise, Idaho, and I hope to see him some time. He has a baby girl."

I have a short autobiography of Ensign Leo A. Fitzpatrick, who says: "I was sworn into the Navy in July. I had a two-month indoctrination course and a two-week tour of duty at a shipyard, and I am now at Cornell. When I finish the course I am taking here, I shall probably get sea duty. The only other news I can tell about myself is that I became engaged to Helen Vincent in September. Four of the other fellows in II-A are also in the Navy. They are Bud Hathaway, Lew Geyer, George Nelson, and Jim Reswick."

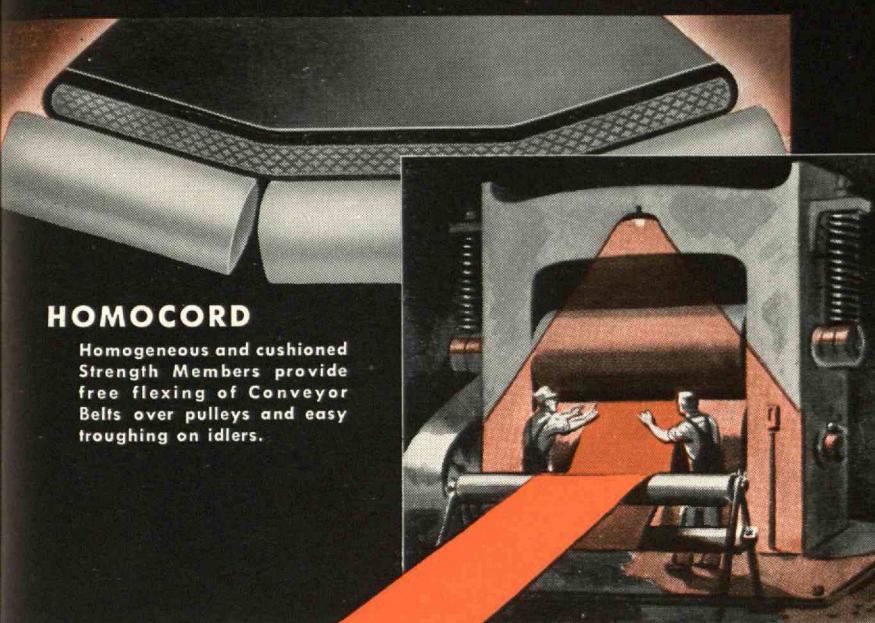
Charlie Swet, who is working for the Cramp Shipbuilding Company in Philadelphia, is apparently leading a histrionic if not a historic life, for he writes: "I lived at the Alpha Tau Omega house at Pennsylvania until June, after which I moved to where I am now. There are about 10 members of the Philadelphia Opera Company here — my roommate included."

Virgil Otto is still in Indianapolis. He writes: "I am still with a naval ordnance plant. When I was in New York on business in October, I ran into Jack Pennington, a Beta, who is working there in an engineering office." — From Westinghouse we hear that Harry Clarke has joined the company's graduate student course.

On November 13, Andrew Peacock walked to the altar with Gloria Kay in New Haven, Conn., while early in October, Elizabeth Hampden became Mrs. Carleton F. Bryant, Jr. Carl is an ensign. Shortly to do likewise are Merton Hubbard, a lieutenant in the Army Transportation Corps, and Elaine Schneider; and Ed Stewart, also a lieutenant, and Carolyn Mariugh.

From Aberdeen comes news that Bud Babcock, Charlie Crocker, Dave Mitchell, Eliot Payson, Stan Roboff, Curt Smith, Gus Smith, and your Secretary were recently commissioned in the Ordnance Department. Babcock, Roboff, and Gus Smith have been transferred to the Corps of Engineers and are now at Fort Belvoir. — CLINTON C. KEMP, *General Secretary*, Barrington Court, 988 Memorial Drive, Cambridge 38, Mass.

MANHATTAN



HOMOCORD

Homogeneous and cushioned Strength Members provide free flexing of Conveyor Belts over pulleys and easy troughing on idlers.

CONDOR V-BELTS

Whipcord construction gives flexibility, strength and extreme lack of stretch.

STRENGTH MEMBERS

... are the **SINews** of **FLEXLASTIC*** Rubber Muscles



Condor
PRODUCTS

Conveyor and
Elevator Belt
Compensated Belt
Transmission Belt
V-Belt
Air Hose
Contractors Hose
Fire Hose
Hydraulic Hose
Oil and Gasoline
Hose
Sand Blast Hose
Steam Hose

Suction Hose
Water Hose
Chute Lining
Laundr Lining
Industrial Brake
Blocks and Lining
Molded Rubber
Goods
Rubber Lined Tanks
Rubber Covered
Rolls
Abrasice Wheels
Bowling Balls

Just as the sinews hold together and strengthen the muscles without limiting their freedom of movement, so MANHATTAN STRENGTH MEMBERS reinforce and strengthen the FLEXLASTICS*, at the same time that they enhance their flexibility and durability.

MANHATTAN STRENGTH MEMBERS are "engineered," each one for a specific service, fabricated and scientifically located in the precise area or section where they contribute the most to structural life and capacity—just as in engineering design of bridges or trusses. Members of suitable materials, correctly proportioned and treated, are properly placed with respect to all other component parts.

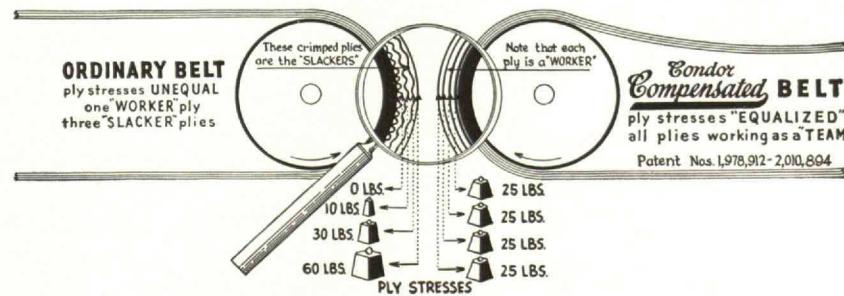
Examination of the diagram below of ordinary and Condor Compensated Belt illustrates clearly what correctly designed strength members accomplish in performance, longer life and notably lower ultimate cost of power transmission. It is an economy which extends beyond the belt itself, to bearing and machine and to uninterrupted production.

Similar advantages result from a long line of exclusive MANHATTAN developments, such as the Homocord principle for Conveyor Belts; Condor Whipcord Endless Belts with Extensible Tips; Condor Whipcord V-Belts; Homoflex Hose in air, water, spray and other types; MANHATTAN Fire Hose with Radio-Active Mildew-Proof Treated Jackets, and many others.

51st YEAR OF RESEARCH

The record of the first 50 years of accomplishment is the pledge for the second half-century. MANHATTAN is now entering with research, testing, care and inspection as a basic policy, so there may be uninterrupted continuity to its contribution to industry. It will always be sound policy to keep ahead with MANHATTAN.

KEEP AHEAD WITH



*The term FLEXLASTICS is a MANHATTAN Trade Mark. Only MANHATTAN can make FLEXLASTICS.

THE MANHATTAN RUBBER MANUFACTURING DIVISION
of RAYBESTOS-MANHATTAN, INC.
EXECUTIVE OFFICES

PASSAIC, NEW JERSEY

Waveform

MEASUREMENTS of the waveforms of electrical currents and voltages are particularly important to the communications engineer. The processes of modulation and de-modulation, and of harmonic generation and reduction and detection, essentially of alterations in electrical waveforms. Consequently, the precise measurement of harmonic amplitudes provides an index of circuit performance.

In other branches of engineering, too, wave analysis is important. Electric power generators must be designed and operated to keep harmonics at a minimum. Vibrations in acoustical and mechanical systems are now measured by converting them to electrical impulses whose waveforms can be analyzed electrically.

Waveform-measuring instruments have for many years been an important part of the General Radio line of test equipment. This Company pioneered in the development of a commercial heterodyne wave analyzer and the degenerative analyzer for the measurement of acoustic and vibration waveforms. General Radio direct-reading distortion and modulation meters have greatly simplified the problem of broadcasting station monitoring and maintenance. In addition, the present line includes many types of wave filters and a continuous-film recorder for oscillographic work.

Up-to-the-minute design and high quality construction are the reasons why General Radio waveform-measuring equipment is used in the world's leading laboratories.

*Because all our facilities are devoted to war projects,
these instruments are at present available only for war work.*



GENERAL RADIO COMPANY

Cambridge 39, Massachusetts
NEW YORK CHICAGO LOS ANGELES